THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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SCIENCE AND WAR.

THE British Association this year is meeting under conditions without precedent during its history of 84 years, and naturally its proceedings are deeply tinged with the influence of the conflict which is raging throughout Europe. All social functions have been omitted from the programme, which is confined strictly to the reading and discussion of papers and reports, and to visits to works and other places of scientific interest. The subjects to be dealt with in many cases are more or less directly related to the war and matters arising out of it, and the address delivered by the President, Prof. Arthur Schuster, on Tuesday evening, which treated of the common aims of science and humanity, contained many allusions to the struggle for existence through which our civilisation is passing, while that of Prof. H. S. Hele-Shaw, president of Section G, was devoted wholly to demonstrating the necessity of utilising the services of every agency at our command not only during the war, but also in the industrial war which will inevitably follow the conclusion of hostilities.

The former was couched mainly in the abstract and philosophic vein, dealing with the affairs of the intellect. The President drew attention to the fact, which we regard as one of the most valuable and hopeful phenomena resulting from the "great catastrophe," that the common danger has dissolved our individual differences, which were dividing the community into groups with widely divergent and sometimes opposing interests, and has revealed that after all the clash of interests is merely superficial, and that we are all united by a solid bond of sentiment and purpose. Terrible and deplorable as are the immediate results of warfare, there is firm ground for hoping that the nation will emerge from the ordeal spiritually awakened and revivified, with a new outlook upon the world of men and things, and with a broader and higher conception of the duties owed by men to the community from which they derive their privileges.

Referring to the position of the British Association and the functions which it should fulfil, the President showed that in the beginning it was intended to be of an exclusive character; in the words of Sir David Brewster, its principal founder, it was to be "an Association of our nobility, clergy, gentry, and philosophers," a definition which reflects the snobbish spirit of the time, and incidentally reveals the traditional attitude of the English people towards men of science, as persons of an inferior grade. Fortunately this narrow-minded policy did not prevail, and the Association, instead of becoming a scientific clique, has been able to exercise a powerful influence on the progress of science and on the dissemination of scientific knowledge amongst lay members of the public; but Prof. Schuster admits that its efforts have been spasmodic, and suggests that the present juncture affords the opportunity to secure greater

continuity in its work and better co-ordination with other scientific organisations. In the Association we certainly possess a magnificent machine of established reputation and efficiency, and it seems obvious that it ought to be utilised to greater advantage than is possible under the existing *régime*; its load factor is lamentably low, and we see no fundamental reason why it should not be enormously improved.

The bulk of the President's address related, as we have indicated, to the intellectual field, and it contains many interesting arguments and epigrammatic observations; the author inveighs against the popular tendency to differentiate between men of theory and men of practice, "without regard to the obvious truth that nothing of value is ever done which does not involve both theory and practice." He points out that "we must guard against accepting a man's estimate of his own power to convert his thoughts into acts. In the ordinary affairs of life a man who calls himself a man of action is frequently only one who cannot give any reasons for his actions."

While we are unable to devote space to a detailed consideration of the address, we feel that the following extract is so true and so significant that it should be quoted in full:—

> If we must avoid assuming special intellectual qualities when we speak of groups of men within one country, we ought to be doubly careful not to do so without good reason in comparing different nations. So-called national characteristics are in many cases matters of education and training; and, if I select one as an example, it is because it figures so largely in public discussions at the present moment. I refer to that expedient for combining individual efforts which goes by the name of organisation. An efficient organisation requires a head that directs and a body that obeys; it works mainly through discipline, which is its most essential attribute. Every institution, every factory, every business establishment, is a complicated organism, and no country ever came to prominence in any walk of life unless it possessed the ability to provide for the efficient working of such organisms. To say that a nation which has acquired and maintained an empire, and which conducts a large trade in every part of the world, is deficient in organising power, is therefore an absurdity. Much of the current self-depreciation in this respect is due to the confusion of what constitutes a true organisation, with that modification of it which to a great extent casts aside discipline and substitutes co-operation. Though much may be accomplished by co-operation, it is full of danger in an emergency, for it can only work if it be loyally adhered to; otherwise it resembles a six-cylinder motor in which every sparking-plug is allowed to fix its own time of firing. Things go well so long as the plugs agree; but there is nearly always one among them that persists in taking an independent course, and, when the machine stops, complains that the driver is inefficient. The cry for organisation, justifiable as it no doubt often is, resolves itself, therefore, into a cry for increased discipline, by which I do not mean the discipline enforced at the point of the bayonet, but that accepted by the individual who voluntarily subordinates his personal convictions to the will of a properly constituted authority. This discipline is not an inborn quality which belongs more to one nation than to another; it is acquired by education and training. In an emergency it is essential to success, but if it be made the guiding principle of a nation's activity, it carries dangers with it which are greater than the benefits conferred by the increased facility for advance in some directions.

The lack of discipline—how prominent a feature is it in the recent history of this nation! We have seen it in politics, in trade unions, in commercial circles—even during the war it has been exhibited, especially in the ranks of labour. It is fraught with danger to the State, which, we grieve to say, has fostered it by injudicious legislation in the past, and it has proved a fatal obstacle to many a promising scheme for co-operation in trade matters. The individual who will not subordinate his personal views to the decisions of authority, and stubbornly persists in following independent lines, is the wrecker of all such hopes, as we have often regretfully observed, and it is particularly significant at a time when the star of our enemies appears to be in the ascendant that he is conspicuously absent from their ranks; the complete subordination of the German to the decrees of those in authority is a matter of common knowledge, and constitutes the chief strength of the nation.

It does not involve servility—on the contrary, the pride of the German is notorious—but it does involve self-sacrifice, than which there is no higher quality, and which is equally manifested by our foes. We would not follow the latter in many respects, but we should be well advised to copy such good qualities as they possess, and as Prof. Schuster states, in an emergency discipline is essential to success. The need of it will be felt not only during the war, but also in pursuing concerted measures afterwards to maintain and advance our commercial supremacy.

But the author sounds a warning note, lest we "beat the utilitarian drum too loudly"; he says: "the combination of the search for the beautiful with the achievement of the useful is the common interest of science and humanity"; "do we not find in the worship of material success the seed of the pernicious ambition which has maddened a nation, and plunged Europe into war?" and he concludes that in the struggle which convulses the world Science gladly gives all the power she wields to the service of the State, "because a war wantonly provoked threatens civilisation, and only through victory shall we achieve a peace in which once more Science can hold up her head, proud of her strength to preserve the intellectual freedom which is worth more than material prosperity, to defeat the spirit of evil that destroyed the sense of brotherhood among nations, and to spread the love of truth."

"Enemy" Goods Passing as "Neutral."

M. Steylaers, whose account of the efforts of German firms to dominate the electrical field in Belgium, and whose reference to the preparations that are being made for labelling German-made goods as "British-made" after the conclusion of the war are already familiar to our readers, tells us in our "Correspondence" columns to-day how German lamps are getting into Spain as "Swiss-made." So long as Italy was not at war such lamps were finding their way into Spain through that country, but since Italy threw in her lot with the Allies in their fight against Prussian oppression, German-owned lamp works have commenced operations in Switzerland whose product may or may not all be of Swiss manufacture though it is allowed to pass through France as such. Our correspondent not unfairly asks what we may expect after the war if such competition is permitted now. We may anticipate that German firms will not then immediately show a very burning desire to mark their products "Made in Germany"—are not those other labels mentioned by M. Steylaers already prepared?—and more things may claim to be Swiss and Dutch than are doing so even now. Such matters are very difficult to control completely under prevailing conditions, and there may be leakage at some points, but we trust that the French authorities who have adopted such thorough measures in dealing with enemy companies formerly owned and operating in France, will be on the alert and ready to confiscate imports of enemy taint.

In other ways the enemy has his agents at work in Switzerland, as the Reuter dispatches from Zurich at the end of August showed. It seems that many Swiss manufacturers and wholesale houses are forming private import trusts in such centres as Geneva, Zurich, St. Gall and Basle, which will give the guarantees that the Allies have demanded that none of the Allied manufactures that they are allowed to receive shall reach Germany and Austria. A vigorous German propaganda is said to have been employed to defeat this effort of the Swiss firms, and it is gratifying to observe that the latter will not yield before the artifices of the Teuton. The Swiss manufacturers will probably find that the products of "neutral" countries will be held in less suspicion by Allied buyers if they assist in the suppression of German exporting across Switzerland of manufactures which, in passing, conveniently change their "place of origin."

The Consular Service Again.

It may be argued that these are peculiarly ill-chosen times for repeating the old criticisms of the British Consular Service; Government Departments are snowed under with far more pressing matters in these days of anxiety, and really have no time, even if they have the inclination, to undertake revision and reorganisation of the system and service. Certainly there is a good deal to be said for that attitude; this horrible and colossal warfare in Europe has placed many world affairs in a state of flux, and all sorts of things are in the melting-pot. Yet when all this, and much more like it, has been said, are we not driven to ask "If not now—when?" "After the war"? when the international trade rivalry resumes, and when it becomes more remorseless than ever—unless statesmen and sentiment, trade ententes and financial conditions, combine to hinder. Reorganisation of the Consular Service in the interests of British industry, and along such lines as shall not weaken diplomatic strength—this is not an undertaking to be effected by a few strokes of the pen, a few substitutions of names, or a discussion in the House of Commons. It will be rather late in the day to begin to deliberate when, as a nation, we are, perhaps suddenly, we hope gradually, returning to the former operations of our industrial life. We have heard whisperings of a something that the Board of Trade was going to do—that it actually had in course of preparation, and probably, if we were permitted to examine the archives of that Department, we might be entertained with interesting disclosures. But in absence of anything definite to guide us on that point, we may be allowed to hope that in these days of war absorption the matter is not being left entirely alone. We never have thought that the Consular Service, if brought to the highest pitch of excellence and efficiency, should be expected to do many things that manufacturers and traders ought to do for themselves. It is not desirable that it should be regarded as a possible substitute for private initiative, but Consuls can help where private parties are helpless, and experience has proved that the Consuls of competing countries have done great things to assist the industries of those countries which their traders never could have accomplished without their aid. One of the strongest criticisms that have been levelled at the British Consular system is that it compares unfavourably with the Governmental official aid given to our competitors. Some comments that appeared in a recent issue of the *Chamber of Commerce Journal* have drawn a remarkable letter from a well-known West-End firm of cigar merchants and shippers (Martins, Ltd.), relating an experience of the British and American Consular services. We quote:—

> We were desirous of extending our business in various countries and we wrote to the British Consuls fully explaining our proposition and asking them to furnish us with a list of importers of good standing of our particular commodities. Although we approached some 30 or 40 Consuls, the response was most meagre and disappointing. One of the Consuls who responded to our inquiries called to see us when he was home a few months after, and we told him what our experience had been. His reply was: "Ah!—I'm afraid his Majesty Consuls are so conscious of the fact that they represent his Majesty, that they pay little or no attention to commercial inquiries."
>
> Well, being unable to get the desired information from the British Consuls, we made inquiries from the American Consuls, and practically every one of them responded, and, moreover, gave us a lot of useful local information. Can we wonder that British business men complain of the paucity and uninformative nature of our Consular reports as compared with those issued by the American Consular Service?

There may be little in common between cigars and electrical manufactures, but we fear that the exporting firms in both trades will find themselves generally in agreement with this complaint. Not that all British Consuls are inattentive or too superior—we have ourselves received letters from numbers of them showing their desire to assist us in certain matters; but compared to what one would expect, the result has been so negligible as to discourage too confident a reliance being placed upon such sources of assistance. Our pages have of late borne ample evidence to the thorough way in which U.S. officials have been reporting for the benefit of American firms on the electrical possibilities of different markets, and our own Department might with advantage take a leaf out of their book; the lack of desire in America to engage in extensive export operations is more to blame for the relatively small dimensions of such business than is its Government Commercial Intelligence Service.

The above letter, however, while it pays a tribute to American excellence, also discloses a point of questionable value from the American point of view. We are not sure that we should regard it as quite a mark of strength for the British Consular service to lay itself out to render assistance to the traders of other countries, though there may be very good reason in certain cases for reciprocal relations. We shall be quite content if something can be done to ensure a more generous and intelligent commercial assistance being given by British Consuls to British manufacturers.

Lead.

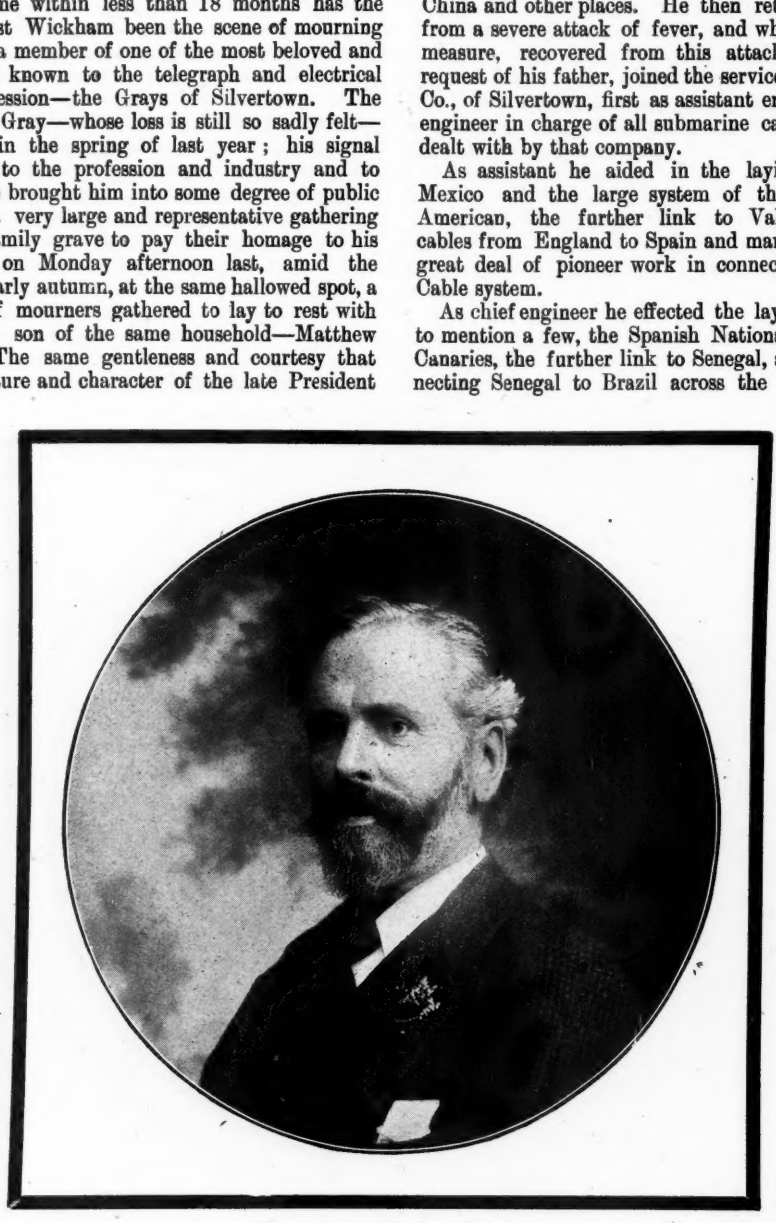
The lead market during the past few weeks has presented several interesting features. On the whole, the market has been irregular, and somewhat difficult, but there is a decided firmness, although at one time the demand for this metal was not quite so active and prices slipped back slightly. The factor which is mainly responsible for the present tone of the market is a lightening of the stocks. Recent arrivals have been far from heavy, and stocks are becoming more or less exhausted. Added to this the loss of a steamer carrying 700 tons to the Tyne has made the position more difficult. Shipments to the Continent, more particularly to Russia, continue heavy, and it seems likely that the bulk of lead arriving during the next few months will be urgently required for shipment to Russia, so that very little may be available for the home market. These shipments are under old contracts. The requirements of Russia are so urgent that it seems as though the question of price will scarcely arrest shipments, but recently very little has matured from the numerous inquiries from this quarter. Besides Russia, Holland and Sweden have been in the market for lead, but business with these countries is naturally difficult to consummate.

The American market has remained very firm, and in some quarters it is hinted that the possibility of fresh attempts being made at manipulation by interests across the Atlantic are not altogether remote. No step seems to have been taken in the direction of meeting the market here, and prices in New York are now £2 to £3 above London parity. The output in the United States is still very high, although naturally consumption, especially for munitions purposes, is great. The American interests in Mexico have diminished their smelting activity for the time being in consequence of the unsettled state of the country, but mines continue to operate. In spite of all the troubles through which Mexico has passed, and is passing, hope is held out for the future of the lead smelting industry in that country. It is believed that the new attitude assumed by President Wilson towards Mexico will produce some tangible results, and that United States smelters will be able to resume active operation of all their plants there at no distant date. Meanwhile Australian and Spanish lead is coming forward in very regular quantities, and as there is every prospect of an increase in the Australian smelting capacity in future, this country should not be so largely dependent upon supplies from across the Atlantic. It is understood that Broken Hill lead is now being tendered against due contracts.

Coal Prices.—At the meeting of the Swansea Electric Lighting and Tramways Committee on September 2nd, the chairman, Col. A. Sinclair, was cordially thanked for having been instrumental in inducing the Executive Committee of the Municipal Electrical Association to take up the question of the exclusion of existing contracts under the Coal Prices Limitation Act with the Government. The result, said Ald. Colvill, was that contracts entered into prior to the passing of the Bill would now benefit to the extent of 4s. per ton when the Act came into operation next November, the same as all other contracts. The Mayor (Ald. Daniel Jones) who proposed the resolution, said that not only Corporations but many private firms would benefit by the Government concession.

MATTHEW HAMILTON GRAY.

For the second time within less than 18 months has the old church at East Wickham been the scene of mourning for the death of a member of one of the most beloved and honoured families known to the telegraph and electrical industry and profession—the Grays of Silvertown. The late Robert Kaye Gray—whose loss is still so sadly felt—was laid to rest in the spring of last year; his signal services rendered to the profession and industry and to many a good cause brought him into some degree of public prominence, and a very large and representative gathering attended at the family grave to pay their homage to his memory. Again, on Monday afternoon last, amid the changing tints of early autumn, at the same hallowed spot, a second company of mourners gathered to lay to rest with honour a younger son of the same household—Matthew Hamilton Gray. The same gentleness and courtesy that had marked the nature and character of the late President of the Institution were also among the admirable traits by which the friends of the now deceased brother had learned to value his acquaintance. While Robert's activities and sterling qualities thrust him almost unwillingly into the public gaze, Matthew Hamilton, shrinking even more from publicity, confined himself to practical work in his own particular departments, keeping in most intimate touch with all classes of men in the course of these business operations, making hosts of friends, and never wearying in rendering useful service in comparatively private channels for the good of his company, his country, and for the welfare of mankind.



Matthew Hamilton Gray.

Photo. by [*A. F. Mackenzie, Birnam, N.B.*

Robert was the eldest and Matthew Hamilton the third, son of the late Matthew Gray, of 106, Cannon Street, London, and Lessness Park, Abbey Wood, in Kent—a fine type of man whom those who knew him are never likely to forget. Both brothers were educated at Greenock and at University College School, London.

Matthew Hamilton Gray retired from the active service of the India-Rubber Co.—the Silvertown company—about seven years ago, but he always continued to take a lively interest in the company's various operations. He passed away at Glenquaich, Perthshire, on Thursday last week, September 2nd, at the age of 61 years, having been born in June, 1854, at Glasgow.

Having decided to adopt the profession of mining engineer, he attended the necessary courses at Jermyn Street, and qualified at the earliest moment as A.R.S.M. To obtain further experience before actually practising, he made a two years' sojourn in South America and the U.S.A., where he visited the most important copper, silver and gold mines; he then became employed in the East, where he remained some three years, organising work in the cinnabar mines and collieries in Borneo (Sarawak), and prospecting in the up-river districts, afterwards visiting China and other places. He then returned home suffering from a severe attack of fever, and when he had, in a large measure, recovered from this attack, he, at the urgent request of his father, joined the service of the India-Rubber Co., of Silvertown, first as assistant engineer and finally as engineer in charge of all submarine cable-laying operations dealt with by that company.

As assistant he aided in the laying of the cables in Mexico and the large system of the Central and South American, the further link to Valparaiso, besides the cables from England to Spain and many others. He did a great deal of pioneer work in connection with the Pacific Cable system.

As chief engineer he effected the laying of many cables; to mention a few, the Spanish National from Cadiz to the Canaries, the further link to Senegal, and the work of connecting Senegal to Brazil across the Atlantic by way of Fernando Noronha. In addition, he was in charge during the laying of other Continental connections with England, and the repairs of many cables throughout the world, a not unimportant portion of the submarine telegraph engineer's work.

For services rendered to life and humanity generally whilst on expeditionary work, he received presentations from the English Government and from the German Emperor, and the Portuguese Government presented him with the Order of Commander of Villa Vicosa.

A very capable all-round engineer, any work he undertook was invariably carried out quickly and successfully, and it is not an exaggeration to state that he was loved by all who knew him for his attainments, his deep reading, and his charm of manner; he was generous to a fault.

He was a good linguist, and apart from the philanthropic work in which he found his great pleasure, he followed with particular interest all geological and seismological studies.

"He was a man, take him for all in all,
I shall not look upon his like again."

Among those present at the funeral at Wickham Church, on Monday last, were the following:—Mr. and Mrs. C. H. Gray, Mr. and Mrs. Wm. Gray and Miss Gray, Miss Margaret Gray, Mrs. Cameron, Miss Cameron, Lady Ann Marsham, Miss Tucker, Mrs. Mitchell, Mr. P. V. Luke, Mr. George Todd, Mr. Herbert Blyth, Major Robertson, Dr. Davidson, Col. Mostyn, Mr. A. S. Johnston, Mr. R. H. Hedderwick, Mr. Stuart Russell, Captain H. Benest, Captain Morton, Mr. J. Jeffrey, Mr. E. Geale, Mr. J. Rymer Jones, Mr. E. March Webb, Mr. Bailey, Mr. H. Alabaster, and Mr. T. E. Gatehouse.

Mr. E. Raymond-Barker sends us the following tribute to the late Mr. Gray :—"On September 2nd died Matthew Hamilton Gray, one of the best-known men of his day in submarine cable engineering enterprise, and, for many years, sea-going engineer-in-chief under the administration of his late distinguished eldest brother, Robert Kaye Gray, who was managing director of the 'Silvertown' company, and (home) engineer-in-chief of that organisation's submarine department. The news of 'Mat' Gray's demise at Glenquaich, in Scotland, must have come as a shock to the many who loved him. It brought a pang to the writer, who for many years, at home and abroad, ashore and afloat, had regarded his departmental chief with that loyal devotion naturally induced by any personality built on the lines of 'Mat' Gray; and now to this kindly and generous-minded soul—who loved children, and was beloved by them—the hitherto Invisible has become the Visible. Fortunately the value of an obituary is measured by the sincerity of its tribute to the departed one; not by the superficial area of the paper it covers. Matthew Hamilton Gray, after passing through University College, London, and other University courses of study on the Continent—specialising in Science and Engineering—took up mining engineering in Borneo, where, engaged in arduous work, he contracted severe malarial illness, which laid the seeds of much intermittent trouble later on. In this matter the writer—himself hard hit by the results of illness contracted in Senegal—can write in all sympathy. Regarding the work Matthew Hamilton Gray subsequently took up in the Silvertown Submarine Department, much might be written, and a long list of cable-laying expeditions might be given. Many of these 'M. H. G.' was in charge of. Later on, when his health began to fail, he carried on at home much useful, organising and supervising work, whilst others took the cable ships to sea. Regarding, however, the work M. H. G. carried out or supervised, is it not to be found in the engineering libraries in a shelf full of printed volumes; records pertaining to the manufacture and laying of many ocean cables in various parts of the world? A final word—The writer found in M. H. G. a true friend; on some occasions of stress, he might have been an elder brother. May God rest his soul.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

A Boiler-Cleaning Machine.

The American Consul in Goteborg reports that an electric machine for cleaning steam boilers was invented about a year ago by Messrs. Sandholm and Olsson, of Goteborg. A corporation, Elektriska Pannrensnings-Bolaget, of Goteborg, was organised by the inventors to have the machine with necessary accessories manufactured and to operate the same. The electric power needed for the apparatus is small, and, in comparison with the old method of cleaning boilers, the time required is very short.

Robust Switches and Fuses.

A special line of knife switches and fuses of particularly robust construction, which should prove of interest to central station engineers and others, has been introduced by the Electric and General Works, Ltd., of 15, Victoria St., S.W. We illustrate a triple-pole switch and porcelain handle fuses of the type in question, from which it will be seen that they are provided with porcelain

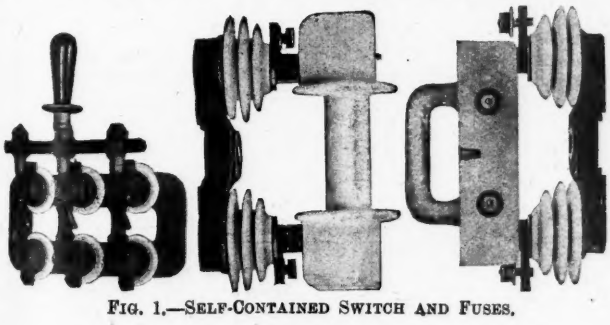


Fig. 1.—Self-Contained Switch and Fuses.

insulators and cast-iron base, thus rendering this type of apparatus eminently suitable for mounting direct on a wall or on ironwork, or for building up "skeleton" switchboards. This special adaptability will suggest many uses to engineers, and the fact that all connections are on the front and extremely accessible will increase their usefulness in certain spheres.

All current-carrying parts are dull nickel-plated, these parts being thus protected against corrosion. In fact, the switches are thoroughly suitable for mounting in dusty and damp premises.

Holophane Industrial Fittings.

During recent years marked attention has been paid to the subject of economical and suitable factory lighting; indeed, in 1913 the Home Secretary appointed a special committee to study this question, which has just issued its first report. Bad or indifferent lighting must result in slowing down the output, and is no doubt responsible for many accidents. With a view to meeting the growing demand for efficient industrial lighting, Messrs. Holophane, Ltd., of 12, Carteret Street, S.W., have introduced a series of industrial reflectors for local and general lighting, and

Fig. 2.—Industrial Reflector for Local Lighting.

for low or high candle-power lamps up to 2,000 c.p. half-watt lamps.

Full particulars of these reflectors, and a good deal of useful information on the subject, are contained in a list just issued by

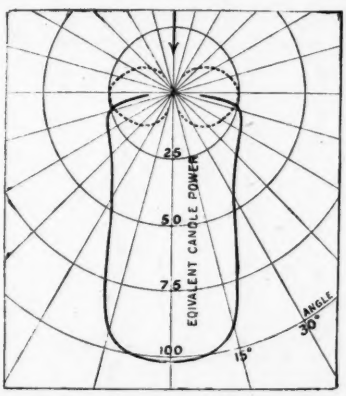


Fig. 3.—Candle-power Curve of Lamp, with and without Shade, shown in Fig. 2.

the firm. The Holophane industrial reflectors are composed of scientifically designed prismatic glass shades, over which aluminium cases are spun in such a manner that they seal up both ends of

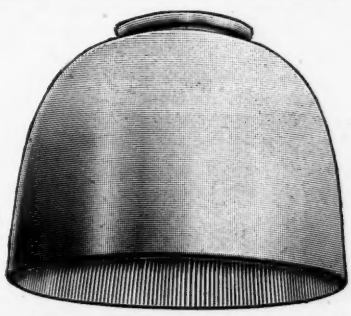


Fig. 4.—Extensive Type Half-watt Reflector.

the glass; in the result, excellent reflecting properties are obtained, and as both inside and outside surfaces are smooth, they are easy to clean and maintain in efficient condition.

We illustrate in figs. 2 and 3 one of the firm's reflectors for local lighting, and photometric curves for the same.

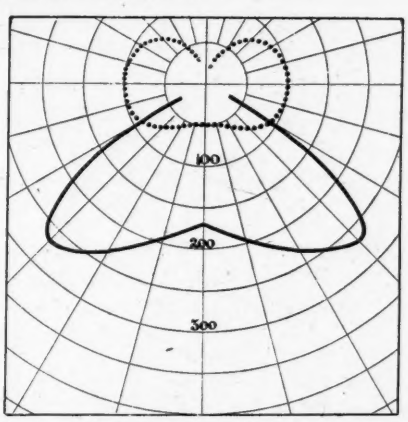


Fig. 5.—Candle-power Curves of Lamp, with and without Shade, Shown in Fig. 4.

Figs. 4 and 5 similarly illustrate an "extensive" type of reflector to use with half-watt lamps in the general lighting of factories.

ELECTRIC REMOTE INDICATORS FOR RIFLE RANGES.

Attempts have occasionally been made to employ electrical apparatus in rifle ranges for signalling the value of each shot, but the arrangements so far devised have usually been of a rather rudimentary description, and could be used only in conjunction with the usual mechanical indicators.

The Marksmen's Society, of Spandau, near Berlin, just before the outbreak of war took a decisive step in this direction, by having all its rifle ranges fitted with electric

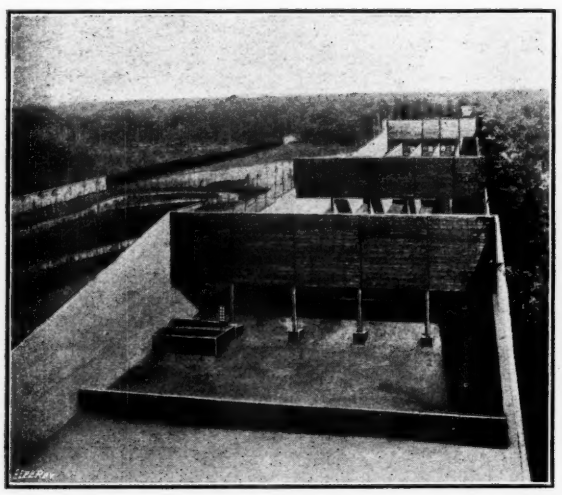


Fig. 1.—Rifle Ranges at Spandau.

remote indicators on the Siemens system. The installation, which was supplied by the Siemens Co., offers a number of novel features, and may be briefly described.

The Society owns extensive shooting grounds, comprising three 300-m., 12 175-m., and two 100 m. ranges, and one of 35 m. Each range is fitted with a transmitter and a receiver, serving to signal the number of the rings hit each time. Each of these apparatus, connected together by electric cables, possesses a scale, the 23 divisions of which bear the inscriptions 0, 1, 2, 3, ... 20, "telephone" and "stop." The transmitter is installed to the left of the target, between the guide bars of two contiguous targets (fig. 2), there being no need to provide any special room for it, as in connection with previous installations. The receiver is arranged at the firing point, to the left of the marksman (fig. 3), and is readily read and checked by the latter, as well as by the secretary seated immediately behind him. Each transmitter and receiver comprises an index fitted with a handle, which is easily adjusted by hand, the pointer and handle of the transmitter being connected, in the interior of the casing, with an adjusting arrangement resembling a small electric motor (fig. 4), which ensures perfect agreement in the readings of the two apparatus. The index of the receiver is shifted by a similar system, and, being protected by a glass plate, cannot be interfered with by the marksman.

With each new reading marksmen are advised by a short acoustic signal given by an electric buzzer, at the transmitter and receiver, which is readily distinguished from the bell signals employed for other purposes. At the marksman's post and on the desk of the secretary seated behind him,

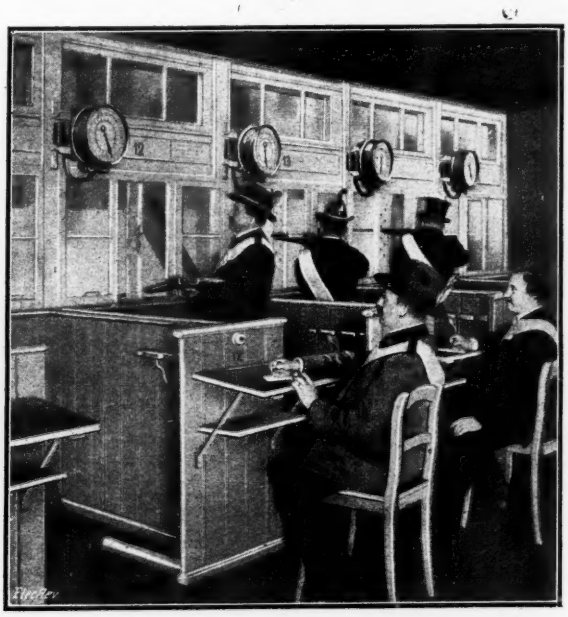


Fig. 3.—Firing Point, Showing Receivers.

there are push buttons actuating simultaneously the buzzers of the transmitter and receiver, which are distinguished by their different timbre.

The installation further comprises a telephone plant. Watertight telephones, arranged in the passage-way of each range, are connected up to an indicator switchboard installed in a special cabin, whence each telephone is readily called.

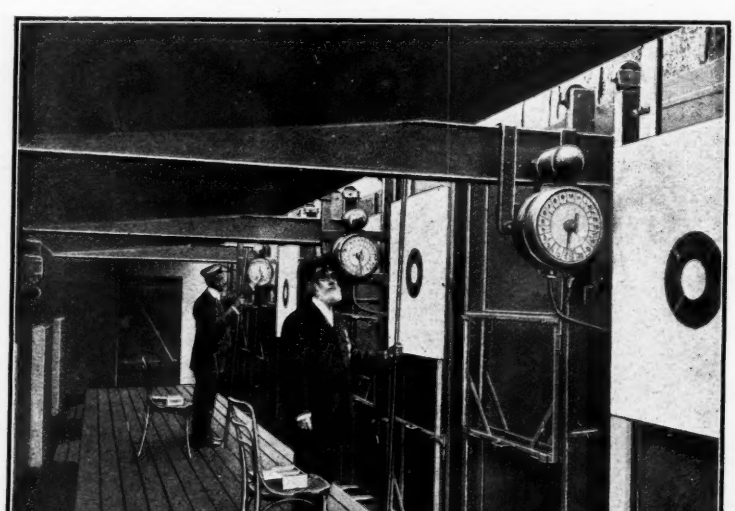


Fig. 2.—Transmitters at the Butts.

In order to get a connection with his marksman, the man entrusted with the operation of the transmitter has only to adjust the index of the latter to the division "telephone," thus causing the receiver index to take up immediately the same position, and advising the marksman that he is wanted on the telephone. The telephone plant has been designed on the central-battery system, the battery being installed so as to be protected against atmospheric influences. The telephone apparatus are joined together by means of armoured cables.

The installation works as follows:—After taking up his post at the firing point and firing his shot, the marksman presses down the push button on his left, thus actuating the buzzers of his receiver and transmitter and calling the attention of the operator. The latter looks for the mark left on the target by the shot just fired, pointing out with a small rod the section in which this mark is found (top,

bottom, right or left). Having then taken down the target, he adjusts the transmitter index to the number of the ring hit by the marksman. While he is shifting this index, the electric buzzers of the transmitter and receiver are sounded simultaneously, and the receiver index takes up the same position as that of the transmitter. The operator finally pastes some paper on the mark made by the bullet, after which the target is ready for another shot.

The first cost of this electrical outfit is in most cases more than made up for by the saving of ground and accommodation. Operating expenses are extremely low. At Spandau, three-phase current at 220 volts, 50 cyles, is available for feeding the apparatus, thus allowing a very simple type of alternating-current indicator to be

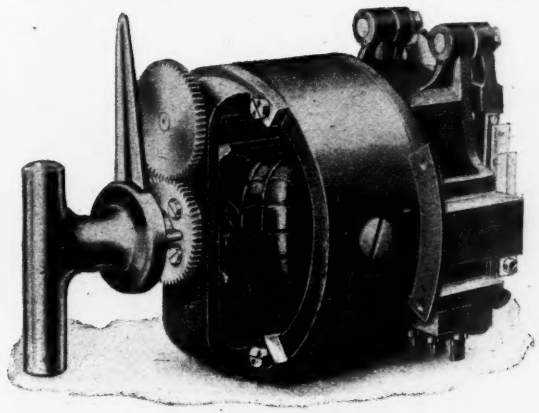


Fig. 4.—Mechanism of Transmitter.

used. The 18 shooting ranges are arranged in six groups each of three, and as each group has an armoured underground cable of its own, any breakdown in operation will be limited to the three ranges of a given cable. Each group communicates with the electric mains through a transformer stepping down the pressure from 220 to 55 volts. The consumption of power of each transmitter-receiver set is about 28 watts.

An additional advantage of the electrical indicator is the possibility, as brought out by actual experience, of shooting at a rate 50 -per cent. higher than usual, which is especially important on the short winter afternoons.

AMERICA AND ELECTRICAL EXPORT TRADE.

In its last Session the United States Congress passed legislation setting up a Federal Trade Commission. The proceedings of that organisation have lately had direct reference to the future possibilities for American electrical manufactures in foreign markets. A very entertaining account of statements made by leaders of U.S. electrical industry when appearing before the Commission, appears in the *Electrical Review and Western Electrician* (Chicago) for August 14th. The writer of the report, Mr. Waldon Fawcett, begins by quoting a statement by Mr. E. M. Herr, of the Westinghouse Electric and Manufacturing Co., to the effect that the American Home Market has been so good that little attention has hitherto been devoted to the exploitation of foreign business. "Now we are suffering for it." It is recognised that the volume of that business is insufficient to even up the fluctuations in domestic business which are inevitable. Mr. Herr mentioned that out of a total Westinghouse business of between £5,000,000 and £6,000,000, something above £600,000 (10 per cent.) was foreign. During the past six months, while things have been disturbed in South American territory, one of Mr. Herr's assistants (Mr. Townley) has made a tour of investigation throughout the entire South American Continent, for he believes that his company ought to, and, under proper conditions, he thinks it could, do a very much larger trade. What Mr. Herr finds to be most pressing is the ability to get proper financial connections in the South American countries, and better transportation opportunities. "We are considerably handicapped in the matter of finance, but . . . that is being remedied" by the recent exploitation in South American countries of U.S. branch banks, whose help is destined to be very useful. Mr. Herr added that his company (in America) did very little export business to Europe, considerable to Africa, but very little to South America. The Westinghouse interests were represented by companies in Europe—British, French and Italian. They did not compete with those companies. The American company had heretofore handled the South American countries, and the British company had had representatives there. "You might say it was competition, because they sold goods and we sold goods in the same territory. Of course, we were very close to their representatives." They would, of course, have very great interest in co-operating with their foreign companies, and it might be possible under proper conditions that they could co-operate with other electrical manufacturers. The importance of this matter lay in the fact that their foreign competitors had no restrictions whatever in that respect, and the American company were meeting very drastic conditions as to prices from German, French and British electrical competition. The Germans were, perhaps, their most severe competitors in South America up to the outbreak of war.

British and French manufacturers were there also in competition, but the American company had suffered most from German competition. Mr. Herr feels that the Germans have a great deal more assistance in the arrangements that they can make under the law than Americans have, and he thinks that this is a field where the American manufacturers can be very greatly helped. "That has got to be done with due regard for the possibility of these foreign competitors of ours establishing agents and sub-branches in our country to enable them to get into any organisation or arrangements that might be made for American manufacturers. It might work to our very severe detriment." In Mr. Herr's estimation America's very greatest interest in foreign trade, aside from the mere broadening of the field and extending the business, is the evening up of the load upon the factory.

It is very difficult, and very expensive, to administer a manufacturing business under constant fluctuation of that business. During the times of depression our overhead expenses naturally go on in very large volume; and the costs necessarily go up. It is extremely advantageous to have a business, as the foreign business in our line has been heretofore. When we are depressed here our foreign business tends to even up the load upon our manufacturing facilities. It tends to keep our employés more steadily employed, and enables us to produce our goods at better costs than we could possibly do if we had that kind of a load to even up and did not have our foreign trade to help us.

Some members of the Federal Trade Commission appeared to be under the impression that American electrical exports consisted largely of supplies rather than of extensive installations, and Mr. Waldon Fawcett in his article states that this erroneous impression was corrected by Mr. Herr, who explained that in addition to doing a supply business his firm furnished large equipments of all kinds in South America and Africa. He spoke of the excellent reputation of American electrical goods for quality—"we are frequently specified as against foreign competition," but other countries

cut the price on us so severely and are able to produce goods and enter combinations (entering the market in ways that are very much to our disadvantage) so that we find it very difficult to negotiate these high class products when produced in competition with them. The financing of large projects through German and British financiers has affected us very seriously, of course, but there are still other agencies.

Mr. Herr went on to disclaim any personal knowledge of the reported purchase by the Siemens-Schuckertwerke people of the plants of competitors in Italy and France, and he was unable to give first hand information concerning the operation of the German electrical cartels.

We get the information that they are able to exploit by means of the assistance not only of combinations among themselves, but also by direct Government assistance. They are favoured in their export trade as against their domestic trade due to freight discriminations, &c.

It is the need of proper financial connections that Mr. Herr appears to regard as of great importance:—"We

are extremely handicapped in almost every foreign country by the lack of financial information available." His own company had not adopted any methods in foreign trade since the war that were particularly different from those employed before. In some few cases customers were caught and could not get their goods, largely owing to the depression in South American territory.

Mr. Calvert Townley, of the same company, and already named above, was able to give the Commission interesting and up-to-date information as a result of his South American trip. He declared that Latin-American markets were closed to a considerable share of Yankee-made electrical goods, for two reasons. One explanation was that a large share of public utility enterprises was financed by European capital, and consequently orders for equipment went to European firms. The other explanation lay in the leakage of information, "due to the circumstance that the banks through which American firms must do business were conducted by foreigners," and Mr. Townley referred to reports, generally current—but unvouched for by himself—to the effect that German banks in South America copied American bills of exchange and invoices, with the result that the information thus gleaned as to American competition, prices, &c., was quickly placed in the hands of German firms. Mr. Townley sees difficulties in the way of common selling agencies abroad, and the chief of these is the difficulty of arranging combinations between producers of high-grade and low-grade products. He fears that the high-grade manufacturers might refuse to go in. He does not think that there would be objection to such a pooling of sales machinery in certain lines, and he cited as an example the incandescent lamp business, there being on the market many lamps of high grade but different in quality—a state of affairs which affords no objection to all the lines being handled by one representative. He summed up his opinion of the South American electrical market in one sentence thus: "Generally speaking, electrical equipment follows the investment."

Mr. Maurice Coster, export manager for the Westinghouse Co., furnished the Trade Commission with inside facts about the export trade in electrical goods to Russia, South America, &c. One of his most interesting disclosures was with respect to German competition in South America:—

> The Germans have been able to reduce their selling expenses by making agreements between themselves as to the territory to be exploited. For instance, a few years ago, we would hardly ever meet any German competition in the Argentine except that of the A.E.G. Co. On the other hand, in Chile we would have nothing but the Siemens-Schuckertwerke competition, whereas we would find all the leading American electrical companies competing with each other in Argentina and Chile.
>
> By reducing their selling expenses the Germans have been able to sell cheaper apparatus. I think if we were to go to our principal competitor in this country and make such an agreement we might be called to task on the ground that we were moving against the provisions of the Sherman Act. We should like to make such an agreement because South America is an immense field. It can easily be divided up. In Brazil, for instance, there is a very decided pro-American feeling. We do not need to meet German competition in Brazil—not always. On the other hand, in the Argentine, where there is so much German and English and Italian capital, we absolutely have to meet competition.

Mr. Walter C. Fish, of the General Electric Co., discussed especially the labour equation in the electrical industry with reference to its effect upon foreign trade. He said:—

> A great many people think there is no nation so industrially efficient as we are, but I am sorry to say that is not so. There are portions of Europe fully as efficient as we are and paying one-half the wages. This brings to my mind the question of not only obtaining foreign trade but of subsequently retaining it. I haven't the slightest doubt that we are going to get more of it. Especially will we get foreign business where the per cent. of labour, so to speak, in the value of the product is comparatively small. Our start in increasing foreign business will be along such lines.

He advocates selling combinations among firms operating in the foreign field for the purpose of cutting down general expenses and likewise to prevent business houses from "needlessly knifing each other." Furthermore, he urges "playing up to the coming generation" by establishing trade schools and apprentice systems. He protests, however, that the industry cannot afford the restriction of output which is to-day manifest in many directions, supposedly due to the influence of labour leaders, &c. "Our costs in this country," concluded Mr. Fish, "must be as low as possible—and fair at the same time—if we are to have any show whatever where labour constitutes an appreciable part of the value of the product to be exported. I am familiar with the costs in many European countries of articles quite similar to those which I chance personally to manufacture, and I tell you we cannot afford to go backward."

Several firms in the electrical field that have not, individually, any need for common selling agencies, have declared for them to the Trade Commission on the theory that such sales facilities abroad would aid the smaller concerns in the industry.

Combination with competitors to work out problems in connection with specifications is the need of the hour.

Mr. Everett Morss, president of the Simplex Wire and Cable Co., said:—"If we are going to make a real drive for export it might be necessary for us to make a combination in some way with a number of our competitors in order to work out the question of specifications. Practice in Europe is quite different from what it is here. We have in many instances got to change the point of view of the foreigners before they will take our goods and combination is necessary to educational work—to overcome prejudice."

If Mr. Morss were to study the "leading English electrical trade journals" he would find that making the market to meet the goods, instead of the goods to meet the market, had been one of the great failings for which expert observers have condemned British traders.

CONVERTIBLE COMBUSTION ENGINES.

(*Abstract of paper read by* Alan E. L. Chorlton, *before the* Institution of Mechanical Engineers.)

It is not the object of this paper to advance the claims of either the gas or the oil engine, but rather to direct attention to the possibilities of a convertible engine designed to use advantageously both gas and oil. In surveying the problem in general, one might at first sight say that the combustion engine most ready to work on differing fuels would be of the self-ignition type, with a cycle approximating to that of constant pressure, in which the heat of compression is always sufficient to ignite the incoming fuel, whether solid, liquid, or gaseous, and the only change necessary in going from liquid to solid would be in the fuel-injection device. In practice, however, owing to the difficulty with solid fuel injection, such a type would not prove workable, and even when the fuel is first gasified the results do not justify the complication. The problem is better met by trying to combine known types for gas and oil in which good results are obtained at the present.

In the normal engines for both gas and oil, the chief difference lies in the degree of compression. Thus the compression of a modern gas-engine using coal as its basis fuel may vary from 90 lb. per sq. in., when using coke-oven gas, to 150 lb. per sq. in. for producer gas (and even higher if waste gases are used from blast-furnaces, &c.). For the liquid fuel engine, using crude or residual oils, the compression pressure may exceed 500 lb. per sq. in., as in the case of a Diesel engine using tar-oil, but may be considerably less if the temperature of ignition is obtained by uncooled surfaces, or if auxiliary or pocket-firing is used.

As between 500 and 150 lb. there is a great gap, the tendency is for practical reasons to combine the lower compression oil-engine and the higher compression gas-engine, and thus deal with a smaller compression pressure range. The desirable characteristics of the convertible engine are:—Simplicity and reliability; economy should be high for each fuel; first cost as little as possible above that of the standard engine for each fuel; easy convertibility; as nearly as possible the same power developed for each fuel.

The consideration of the subject may be more clearly undertaken by dividing the types of engines in use into three groups, with further subdivisions, due to peculiarities of design:—

1. Engines of low compression and low power.
2. Engines of high compression and higher power.
3. Engines of medium compression and higher power.

Group 1.—As an example of the first group, we may take an ordinary motor-car engine, having a compression up to 90 lb. per sq. in., which, with slight modifications, will run on:—

(*a*) Petrol or benzole.
(*b*) Good paraffin with an exhaust-heated carburetter.
(*c*) Town gas.
(*d*) Producer-gas made from coal or waste combustible materials.

It is designed for and works best on petrol; fairly well, however, but not so economically, on town gas; it requires very good paraffin; and is not efficient at the low compression with producer-gas.

To go further and extend the range of fuels, to use a commoner paraffin or a good brand of crude oil, means must be provided whereby more heat is available for the ignition and combustion of the oil, and this can be conveniently done by the addition of an unjacketed portion to the cylinder end, when the engine becomes of the hot-bulb type. A change of parts for such an engine does

not present any difficulties, and these can be readily made to give with any adjustments of compression necessary for the producer-gas the greater heat required for ignition and combustion of the oil. The gas fittings are provided with electric ignition, also suitable when petrol is used, whilst the paraffin and good crude oil would be self-ignited by the hot bulb.

Comparative commercial results obtained from an engine lately built with success to work on all usually available fuels, for small powers, are as follows :—

	Compression.	Maximum pressure.	M.E.P.	B.TH.U. per B.H.P.-hour.
Paraffin oil ...	55	210	58	14,500
Producer gas ...	90	230	65	12,000

Group 2.—This group is represented by the Diesel engine, with a compression of over 500 lb. per sq. in., when using tar oils (unless an ignition oil is used). As the maximum compression for gas (in the normally used type of engine) does not exceed 150 lb. per sq. in., it will be readily seen that there are considerable mechanical difficulties in building an engine in which both of these compressions can be obtained, with a reasonable amount of modification. Further, the Diesel engine has an expensive high-pressure

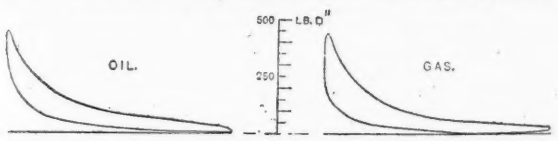


Fig. 1.—Engine Indicator Diagrams.

air-pump, which is unnecessary for the ordinary type of gas engine.

Apart from the mechanical difficulties, we may compare the commercial possibilities of this type, the oil and gas sides being as follows for engines of the same cylinder dimensions :—

	Compression.	Abnormal max. pressure.	M.E.P.	Approx. B.TH.U. per B.H.P.-hour.
Oil engine ...	500	Over 1,000	100-110 lb.	8,000
Gas engine ...	150	600	80 lb.	8,500

These figures show how incompatible the two designs are, for they illustrate that the Diesel structure must be built twice as strongly for the very high maximum possible pressure, due to the fuel valve sticking, &c. The higher M.E.P. used is some compensation for this extra cost and weight. The mean cylinder pressures reveal a still further disadvantage when the gas conversion is considered, for there is, besides this high first cost, a reduced power, owing to working at a lower M.E.P.—80 as against 100-110 lb. per sq. in. A convertible engine on these lines does not seem a commercial possibility.

Group 3.—Engines with a moderate compression suitable for developing higher powers. The range of the compression of these engines lies in between that of Groups 1 and 2, and usually is from 150 to 300 lb. The compression of 150 lb. is suitable for most

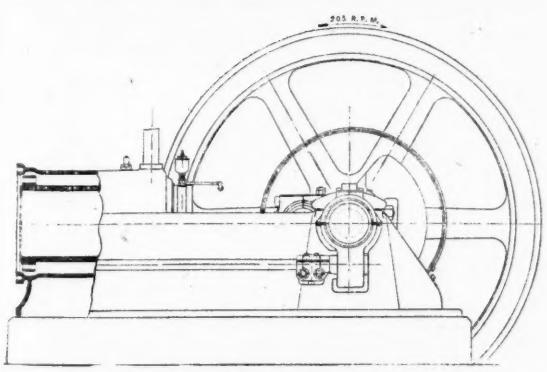


Fig. 2.—Ruston Convertible Engine.

forms of producer-gas, but it is not usually exceeded, for the reason that pre-ignition of the compressed charge is more prevalent in very high compression gas-engines. On the other hand, it is necessary for all compressions below self-ignition compression, as in the Diesel, to employ some auxiliary means to obtain the necessary height of temperature for the proper combustion of the residue oil. Normally, the additional heat is obtained by an unjacketed surface or combustion bulb at the cylinder end. For the lower compression, such as 150 lb., a satisfactorily running oil-engine is obtained; the economy, however, is not quite so high and the range of fuel not so fully extended.

The various devices employed in and around the question of temperature, compression, and convertibility of this group of engine, may be considered by subdividing it under the following heads :—

(*a*) Engines working with a compression not exceeding 150 lb. both for oil and gas, and which may employ pocket-firing with or without air-injection for one, and electrical ignition for the other, or some combination, the smaller compression not involving material mechanical change of the parts.

(*b*) Engines working with a higher compression for oil than gas, involving some modification of the combustion chamber by substitution of a part for oil as against a part for gas; otherwise maintaining the simplicity of both types.

(*c*) Engines obtaining the necessary change from gas to oil by temperature control of the air charge, together with alteration of the valve settings.

(*d*) Engines employing the super-compression of Dr. Dugald Clerk, to control effectively thereby the compression required for either fuel. (Final ignition temperature by other means.)

Under subdivision (*a*) there is a large number of engines which are used only for oil, but which might, without material alteration, become effective in the use of gas, although the whole combination is not as efficient as the highest individual member. As an instance of this division, there is the two-cycle Bolinder engine, at present only used for oil, although originally used by Day for gas. When made with a stepped piston, with uncooled cylinder-head replaced by a water-cooled one, a gas-engine for small powers is more or less effectively obtained.

For larger powers it is usual to separate the air and gas in the pump, and the engine becomes therefore not quite so simple a proposition to change over from the use of oil to the use of gas. In the four-cycle engine, the change from oil to gas involves an exchange of the unjacketed part of the combustion head for that of a gas type, with electrical ignition.

A variation of this type, employing air-injection for the fuel, combined with pocket-firing for the ignition of the charge, secures considerable economy when used with oil.

In considering division (*b*), a comparison of its possibilities for engines of the same cylinder dimensions is as follows :—

	Compression.	Abnormal max. pressure.	M.E.P.	B.TH.U. per B.H.P.-hour.
Oil engine ...	250/280	600	80	8,100
Gas engine ...	150	600	80	8,500

It will be seen that the outputs, &c., bear a great similarity.

Further, the diagrams actually taken with oil and gas are very similar (fig. 1).

The possibilities of this type of engine appear to be very great, and an engine of the kind, made in considerable numbers, is shown in figs. 2-4.

The only change involved in converting from oil to gas lies around the combustion bulb of the oil engine, in which the fuel oil is injected, and in the change from an oil-type to a gas-type piston.

Group (*c*).—The use of the arrangements grouped in this division may be said to be one of mechanical and constructional

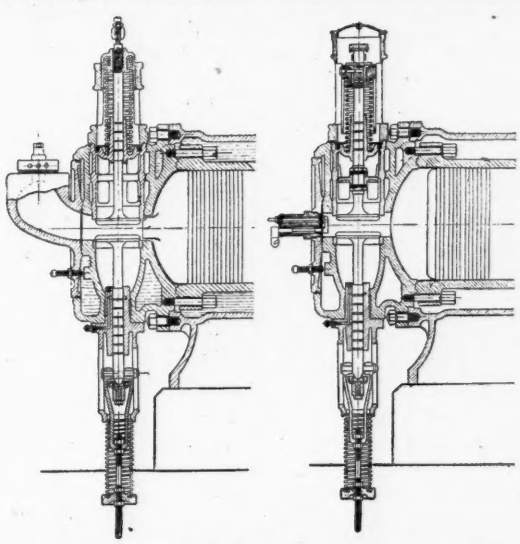


Fig. 3.—Arranged for Oil. Fig. 4.—Arranged for Gas.

convenience, for they can hardly be defended on the score of efficiency. In one method the jacket of the cylinder cover or breech-end is formed to withstand a pressure, and is worked in the manner of a boiler. The increased heat is impressed in the charge of air during the compression stroke to raise the temperature sufficiently to afford ignition. This arrangement thus replaces the hot bulb or unjacketed end of the cylinder. It has some advantages, in that it is perhaps more controllable, and the steam generated may be used for some useful purpose, perhaps in conjunction with an exhaust-heated boiler for an auxiliary steam cylinder on the main engine. The water injection of some hot-bulb engines is also done away with. This type of engine is unusual in practice. When in use as a gas engine, such a convertible engine would have to dispense with the pressure-jacket temperature when using the lower compression and temperature needed for such an engine. The valve-setting of an engine may be modified to give suitable compressions for oil and gas; this can be worked in conjunction with the temperature arrangement just described.

Group (*d*).—The Clerk super-compression engine is a much more suitable and promising type for dealing with the variable compression problem of the convertible engine. In this engine an extra charge of air or inert gas is added to the working mixture at the end of the suction-stroke. By this means, owing to the, so to speak, "watering" of the charge, much lower maximum flame temperatures are obtained and a higher mean cylinder pressure rendered possible. For the purpose of the convertible engine, it is mainly suitable, as by varying this amount of added air the compression can be adjusted between wide limits, the final tempera-

ture being controlled by any of the previously indicated means. For instance, with a compression of 300 lb. maximum, the full displacement of the air-pump may be used; for the lower compression of the gas-engine one can, by any suitable valvular means, such as an ordinary by-pass, reduce the amount of discharge as required.

The commercial value of this type has hardly been determined in practice, but it would almost appear that its possible usefulness will only come in for large engines.

The conclusion the author arrives at is that, for powers up to say 1,000 B.H.P., the type of engine represented by the "Ruston," Class B, is the most suitable as a convertible engine, whilst for still larger powers, when tandem engines and size and weight of removable parts become a problem, the Clerk super-compression type offers very interesting and hopeful possibilities.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Automatic Lift Accidents.

I was very much interested in the article by Mr. F. Broadbent under the heading of "Automatic Lift Accidents," also the correspondence which followed.

In Mr. G. Rosenbusch's letter, he mentions seven important requirements for an elevator. There is still one more in my mind, which is of very great importance, *i.e.*, that an appliance should be on the control board to prevent anyone taking the car away from the floor at which it has just stopped without giving the person inside the car time to open the door, which means that unless he presses the stop button, and then re-presses the floor he wants, he will be taken to that floor which the button is pressed from.

Only the other day I was in a push-button elevator with a gentleman friend, and we had landed at the middle floor, and he was just about to open the door, in fact, his hand was on the lock, when somebody at the top floor pressed the button, and started the elevator upwards.

I might mention that to open this lock one has to put his fingers in a small slot in the door, and it is quite possible that these can be caught; but, of course, there is a stop-button in the car. One may not think of this at the time, and perhaps if the hand was caught, he could not reach it, and a serious accident would possibly be the result.

There are many push-button lifts on this market which do not provide any safety in this respect, though I know of one or two which have special relays which make it impossible to move the lift after the button has once been pressed in the car, until the door has been opened and re-closed.

At the same time, the rule which has first consideration with many purchasers of an elevator is "What is the lowest price for which I can get an elevator?" without their taking into consideration what they are actually getting for their money, and as long as it goes up and down they seem satisfied.

In my opinion, an elevator that is not installed with regard to safety is dear at any price.

I trust this letter will not be too late. Unfortunately we are so far from the home country that we cannot enter into discussions on the different electrical subjects which are printed in your valued paper.

Harry E. Lintott.

Brisbane, *July 20th*, 1915.

American Trade.

Your correspondent "P.R." (ELEC. REV. July 30th) waxes sarcastic at my expense on American methods of conducting export business. However, as he places us in the same class with his own countrymen, I have no kick coming.

The point I was attempting to drive home was merely this: The exigencies of the business situation at present are such that the British manufacturers, apparently, are not able to supply their home commercial demands, while Americans, for the same reason, are suffering from a dearth of orders. From our point of view this situation, we think, cannot last for much more than a year, consequently, if we can help out our British cousins, the temporary relief would not be sufficient to go to any great expense, and hence the suggestion in my last letter. It is only a small matter for the British electrical engineer to study out, as the consumer would never know the difference.

America, that is, the U.S.A., is naturally selfish in its own interests, for our country is large enough to take care of its own products, and it is merely in cases of this kind, where the balance is so vastly upset, that we should try and adapt ourselves to circumstances while they last. Our export business, while apparently very strenuous on the surface, is really not much to boast of, as a casual perusal of some of our commerce reports will show. There is a vast array of figures and so-called facts, but, judging from a few inquiries among the trade, they don't seem to be thought much of. Many factories in this country object to any sort of export business. They consider it too much trouble to examine credits of prospective foreign customers, and, therefore, demand "cash with B.L." "P.R." points out the "take-it-or-leave-it" policy of the British manufacturers, and as a fairly extensive traveller I can vouch for the truth of it. The reason for this is that Britain's Colonies are so tremendous that they take, perhaps, 75 per cent. of her foreign exports. However, she is dealing with her sons or grandsons, who think "there is no place like home," and so are perfectly satisfied.

The reference to Germany is quite true and very *apropos*: she is, perhaps, the best "producing" nation, and she must have an outlet somewhere; consequently, her policy is "Get busy," no matter what the cost, nor how you do it, "get orders!"

E. W. Stevenson.

Brooklyn, U.S.A., *August 21st*, 1915.

"For Those in Peril on the Sea."

The further outrage on humanity in the sinking of the non-combatant liner *Arabic* is yet another reminder of the dangers to which our brave seamen are subjected. Since the declaration of the blockade by Germany, the crews, and, in many instances, the passengers also (including men, women and children), from no fewer than 42 ships have been received into the various Sailors' Homes and Institutes of the British and Foreign Sailors' Society. The rescued seamen have received food and shelter and medical attention at the hands of our missionaries, and in not a few cases an entire outfit of clothing has been provided. This work has been undertaken in our homes at Aberdeen, Barrow, Falmouth, Milford Haven (where the victims of the *Falaba* were received), Weymouth, Havre, Las Palmas, and Buenos Aires.

In addition to this practical ministry, the Society has distributed nearly 50,000 warm woollens to the men of the British Navy and mercantile marine, the mine-sweepers, lighthouse and lightship keepers, etc. At least two tons of bright, readable literature have also been dispatched. In view of the coming autumn and winter, may I venture to enlist the sympathy and practical support of your readers in this great work? In addition to funds, the Society would be very grateful for gifts of clothing—suits of clothes as well as underwear—woollen garments, magazines, books, games, etc., to be sent to our headquarters, The Sailors' Palace, Commercial Road, London, E.

Radstock,
President, B. and F. Sailors' Society.

The Sailors' Palace,
Commercial Road, London, E.
September, 1915.

Trade Entente after the War: The Other Side of the Question.

The writer of the "communicated" article in the REVIEW under the heading "Trade Entente after the War," seems to have arrived at a number of conclusions in regard to the proposed action to be taken by the Allies in the commercial world after the war, and some of these are so extraordinary as to call for reply. He (the writer) appears to consider that a policy of masterly inactivity would be the most advisable one for the Allies to pursue. The present writer begs to disagree, and with all possible emphasis, and therefore he takes some of the statements concerned and will try to deal faithfully with them.

The first one to hand runs: "The purchase of the best goods in the cheapest market is the foundation of all successful trading. Any other system which, by imposing artificial restrictions, seeks to evade this unalterable fact, is certain to defeat its own end." That is to say, if the Allies adjust their tariffs, or introduce new tariffs, to restrict the entry of German goods into the Allied countries or their colonies, the arrangement would fail. The effect of German tariffs upon British goods is to exclude or penalise British goods, and what is sauce for goose is sauce for gander. "The purchase of the cheapest goods is the basis of trade": it is only one of the elements of successful modern business. Another element is to crush all competition and then make your own price, which is what the Germans will do with us if we do not alter. We must respect the laws of sound commercial trading, and let the German make his own.

Then our old friend, the Free Trade plank, turns up next, to wit, the argument of the special geographical or traditional or climatic advantages possessed by certain German products, in which we, the Allies, are lacking. We are told that we cannot hope to compete in toys. Well, our children will not be without toys this Christmas, in spite of the absence of the usual German article. We refuse to believe that British workers cannot make toys to compete in price or quality with the alien enemy once they are placed on equal footing as regards tariffs. The toy industry is instanced as a speciality of the Germans; on our side we have cotton in Lancashire, and South Wales steam coal, mentioned. He says: "The exports of cotton . . . . have maintained a steady level" (that is from Lancashire). In his book, "Fields, Factories and Workshops," Kropotkin says in Chapter I: "At the present time, *i.e.*, 1898, Germany remains tributary to Lancashire for the finest sorts of yarn only." Now the

finest counts are necessarily the most expensive. So that the steady level mentioned is the level of value only, the quantity is greatly reduced from that of a few years ago; the Germans make the coarse counts and will gradually cease to buy even the fine ones. So much for the geographical advantage theory. We can make toys, and the Germans cotton goods, but we cannot sell our products in Germany if there is a tariff in Germany and none in this country.

Again, we are told that "in the electrical engineering sections the Germans have built up a colossal system of specialisation . . . the result being that British machine makers have been able to obtain certain machine parts from Germany cheaper and better made than from any other source. If these supplies are stopped . . . the British makers will either have to put in inferior parts, or pay extortionate prices." Quite so; the specialisation may be exemplified by the A.E.G., which makes electric trains, motor cars, tires, motors and dynamos, electric cables, colliery equipment, and so on; all the goods, in fact, which would be made by a dozen British firms of "specialists." The A.E.G. are thus enabled to specialise in selling all these goods in our markets at prices below our own cost prices. Some time ago the writer had occasion to work up some details in regard to a proposed agency in Germany for a British cable firm. The German goods were copied to the last stitch, and it was then found that their selling prices were 10 per cent. below our cost prices. And to our cost was to be added freight, duty, and profit. No one will be surprised to hear that we do not make a lot out of the German business. On the other hand, there are firms in London which sell German-made cable, but which figure as all-British cable firms. They have no cable works in this country. Again, we refuse to concern ourselves with any fear that British machine makers will be inconvenienced by the absence of any German-made parts or fittings, or that they will have to substitute inferior material. Rather will their own work be better in the absence of the cheaper German machines, which are protected in Germany by the "artificial restrictions" which the writer advises the Allies to avoid. When the Allied Governments give the lead, individual firms, and the various associations and business organisations will fill in the details, so that we can have a tariff or prohibition upon such articles as we can do without from Germany. We suppose that the construction of German tariffs was based upon the "sound economic principles governing the laws of fair and legitimate trading," and, if so, the same remedy will answer our purpose. Really, leaving the main issue for a moment, it is astounding to hear that the Huns are still entitled to "fair and legitimate" dealing; but perhaps the writer does not mean this.

Then the writer goes on to say that "the mutual interests of the Allies will be best served . . . not by artificial restrictions . . . but by improving and strengthening their own" commercial systems. This is rather a paradox, because the Allies can only improve their own lot by fighting the German with such "artificial restrictions" as they can command. For several decades the Germans have used their Zollverein union, their bankers' trade assistance and subsidies, in the war on British commerce. For the Allies to use the weapon of the tariff collectively and reciprocally against the common enemy would, we are asked to believe, be ineffectual. If that be true, it would be useful to have it explained in a little more detail. One thing it is certain a tariff would accomplish. It would close the doors of many offices in our towns and cities where hitherto Germans (naturalised and Anglicised, or not naturalised and unashamedly German) have hitherto been installed. Their mission has been to sell all sorts of German goods from electric cables to superheaters. The only rates they pay on account of their businesses are included in the office rent; their goods pay no toll to balance the rates and taxes of the native British factories, with whose products they compete. Even a beneficent Government gave them a vote in the affairs of the British Empire, so that they could support Free (and legitimate) Trade for the Fatherland in Britain and some of her Colonies.

Frankly, we do not believe the writer when he says that to cut off communication with the commerce of Germany would be to mutilate the whole body commercial. At any rate, with one or two exceptions we have jogged along quite nicely for one year without their products, and are arranging to do without the remaining one or two articles by making them ourselves. To so continue without their services will do more for us than to restore business after the war to the *status quo*. To counsel returning to business as usual is to place a strong inducement to our Allies to follow the line of least resistance, and buy again from Germany. Let us take warning from Italy, and say from now "Hands off." If the Kaiser had been asked five years ago as to the possibility of the Allies joining against him, would he have admitted the likelihood of such a contingency? Well, it has occurred, and, on the same line of argument, it is also possible to take joint commercial action against him. It is not necessary to discuss the means or process of such action, or whether this or that set of men will or can do it; we must not allow Germany to get a new footing, and we must take action in the British Empire, even though the joint action of the Allies does not ensue.

No drivel about "cold dispassionate laws of commercial systems" will avail us to day or on the day that peace is declared. The Huns have respected no laws, written or unwritten, have allowed no claim on the part of nations under signed treaty, have granted no protection on the grounds of either age or sex, and suffered no consideration of any sort to turn them from their determined course. Their only "cold dispassionate" law has been that might is right. The world will not be safe until they are out of action in both the military and business sense, for their commercial morality is about on a par with their military traditions, and a trade entente will, therefore, be for the Allies in the nature of a measure of self-defence and a means of completing the task which we hope the Allied armies will duly accomplish in the not distant future.

Commercial.

Selling Organisation in the Electrical Industry after the War.

It may be interesting for your readers to be impressed with a few facts which have just been brought to my attention. Although they apply to the Spanish market, their general consequences will bear also on all neutral markets, and indirectly on the Allied markets.

As you may happen to know, the position of the electric lamp industry in Spain was, up to a few weeks ago, almost the following:—

Spanish industry produces Spanish-made lamps at cheap prices, yet there was an opening for foreign industry in spite of the heavy import duties in Spain.

Since the entry of Italy into the war, German lamps have been almost entirely prevented from entering Spain. Now, however, I have definite information that German well-known brands are entering again in Spain from Switzerland, *where factories have been started under Swiss names and their products are allowed to pass through France as being Swiss goods.*

In such a way those so-called Swiss lamps are offered approximately 30 per cent. cheaper than any other lamps from the Allied countries.

It is a matter of urgency that the attention of the French Government should be drawn to the fact that some Swiss products are not purely Swiss, but conceal German origin. If we fail to stop such kind of competition during the war, what will happen after the war when, apparently, all German goods will be naturalised Swiss or Dutch? This question is of the highest importance, and steps should be taken in France to examine the position.

Incidentally, I wish to point out that the very low quotations adopted now by German manufacturers in the lamp business for their export goods show that, as has been told in different quarters, the German industry is working heavily on stock and making ready to overflood all neutral markets, and thence our own countries, after the war, if we do not effectively stop the leakage, not merely with certificates of origin, but by an absolute control of the producing industries and their ultimate nationality.

We should be really too simple if, after the terrible strain put on all the Allied countries, we were not intelligent enough to reap also the benefits of our sacrifices.

R. Steylaers.

London, E.C., *September 2nd*, 1915.

Advertising.

I should like to ask the firms who advertise in the Electrical Review why it is they do not give the names of their representatives or agents in foreign countries. Here in the Argentine Republic it is often difficult to find out the representatives of a certain firm, and reference to English technical papers very seldom helps one. Small matters such as these all help to strengthen British interests, which now more than ever should be strengthened, so that we may be the better able to secure a large proportion of the orders that will surely follow the cessation of hostilities.

River Plate.

August 9th, 1915.

Australian Steel.—A correspondent has sent us a copy of the admirable souvenir of the opening of the new steel works of the Broken Hill Proprietary Co., Ltd., at Newcastle, N.S.W., the illustrations in which show that a very serious and promising effort is being made to establish the manufacture of steel in the Commonwealth, and to turn to advantage the company's valuable deposits of iron ore, which has an average richness of no less than 68 per cent. metallic iron—more than twice the content of our Cleveland ore. The plant is of the most modern description, and has been laid out with a view to facility for extension; at present one blast furnace is at work, and supplies pig-iron which is converted into steel in open-hearth furnaces, after which the metal is rolled into rails or merchant sections on the spot. The existing equipment has a possible output of 120,000 tons of steel rails per annum, but the average imports of rails into Australia amount to 150,000 tons per annum, and the demand will probably increase enormously; in 1913 the total imports of iron and steel were valued at 7½ millions sterling, so there is obviously ample scope for the new works. Electric power is provided by a number of 500-kw. d.c. generators and vertical high-speed engines, apparently of British make, but details are lacking on this point.

THE BRITISH ASSOCIATION.

The Manchester meeting of the British Association for the Advancement of Science opened on Tuesday evening with the delivery of the presidential address by Prof. Arthur Schuster, in the Free Trade Hall. The scene was vastly different from that depicted in an old print of the B.A. meeting in Manchester in June, 1842, when Lord Francis Egerton delivered his presidential address in the Friends' Meeting House in Mount Street—less than a stone's throw from the Free Trade Hall—to an audience composed, in part, at any rate, of estimable ladies in poke bonnets.

Since the British Association first met in Manchester, over 70 years ago, civilisation and science and industry have made rapid strides. The year 1842 was a year in which "people still talked of electric cables with bated breath," as one Manchester man has aptly described it; and certainly a casual glance backward brings instantaneously to mind innumerable discoveries of far-reaching importance and value which have been made since Manchester first entertained the British Association.

The Association met in Manchester in 1861 and in 1887, and the meeting in the latter year still holds the record in point of attendance of members in this country, 3,838 persons being present. Under happier circumstances, the present meeting would probably have been not one whit less successful, judged from the standpoint of numbers; and the Manchester that is accustomed to big things was fully determined, when the invitation to visit the city was extended to the Association two or three years ago, to make the 85th meeting of that august body a record. As it is, the attendance of members is round about 1,200 or 1,300; and although the number is small by comparison with that of previous years, the officials are perfectly satisfied, having regard to all the circumstances.

Prof. A. Schuster, the President, is, of course, no stranger to Manchester. His father was once in business in the city, and he himself was at one time a student, and later an honorary demonstrator at Owen's College—now the Victoria University of Manchester. In 1881 he was appointed to the newly-founded chair of Applied Mathematics at the University, and in 1888 became Professor of Physics and Director of the Physical Laboratory, holding the office until 1907.

The various Sections are meeting in the theatres of the University, in the Dover Street High School close at hand, and at the Municipal School of Technology, which is a good distance away in the centre of the city. The Engineering Section (G) is holding its meetings in the Engineering Department of the University. The programme of papers arranged for submission covers a wide field, but practically the whole of the session on Thursday was to be devoted to Manchester municipal engineering undertakings, in which, of course, the electricity undertaking and the big Barton project hold prominent places.

Of wider interest, public speculation was mainly directed to the discussion on means for the promotion of industrial harmony in Section F (Economic Science) between representative gentlemen—employers, trade unionists, and economists. This subject is one of deep and vital importance to the country, to its commerce and its labour, and the liveliest interest was manifested in the subject, even before the discussion was entered upon. Any suggested means to hasten the time when sudden disturbance and shock to industry through lack of "industrial harmony" shall cease, merits, and will assuredly receive, the closest and most careful consideration.

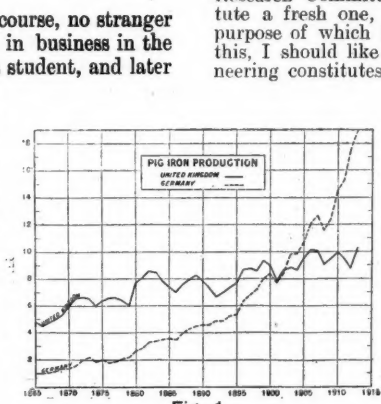


Fig. 1

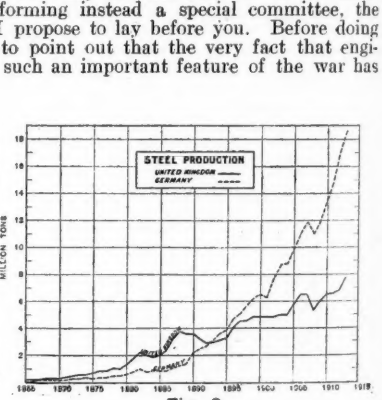
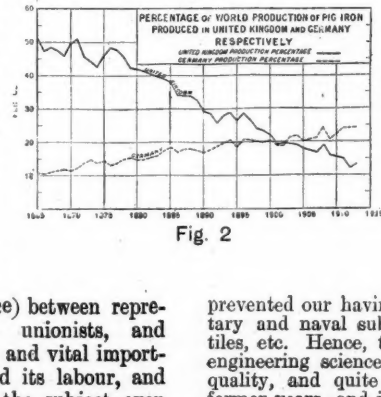
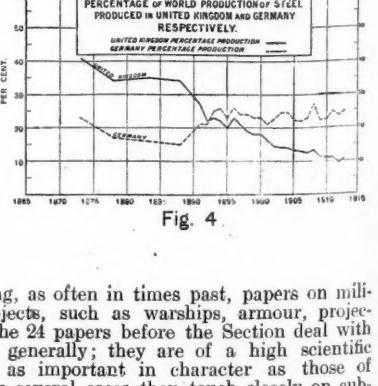


Fig. 3


PERCENTAGE OF WORLD PRODUCTION OF PIG IRON PRODUCED IN UNITED KINGDOM AND GERMANY RESPECTIVELY
UNITED KINGDOM PRODUCTION PERCENTAGE
GERMANY PRODUCTION PERCENTAGE
Fig. 2


PERCENTAGE OF WORLD PRODUCTION OF STEEL PRODUCED IN UNITED KINGDOM AND GERMANY RESPECTIVELY.
UNITED KINGDOM PERCENTAGE PRODUCTION
GERMANY PERCENTAGE PRODUCTION
PER CENT.
Fig. 4

Presidential Address to the Engineering Section, by H. S. Hele-Shaw, F.R.S.

(*Abstract.*)

The time is not an ordinary one, for the war which a year ago cast its shadow over the meeting of the British Association in Australia has, as the months have passed by, gradually unfolded the most terrible page in the history of the world. It is terrible not merely because of the frightful slaughter which has taken place and which will yet take place, owing on one hand to the gigantic armies employed, and on the other to the nature of modern warfare. I do not know which will hereafter stand out in the blackest light—the callous disregard by our enemy of the recognised laws which have governed warfare amongst civilised countries hitherto, or the fact, of which there is now abundant and overwhelming proof, that this country, while animated only by peaceful intentions, was itself the real object and ultimate aim for the destructive effort of our enemy.

Fortunately we now all know that our determination at any cost to ourselves to stand by our treaty obligation to a weaker country was really a fateful moment in the history of our Empire. Had we then failed, such failure would have spelt our own doom.

We are told by soldiers that practically any applications of science constitute legitimate warfare, and that the only way to escape from destruction ourselves is to employ all the resources of science in our own defence. It is on these grounds that the meeting of the British Association for the Advancement of Science has been held this year, because science is proving such an all-important factor in the present war.

The mere holding of this meeting, however, with a vague sort of idea that science is associated with war, does not meet the real needs of the case. Our failure in this war means the loss of what has been built up in so many centuries, and what we value above all other things, viz., our freedom, and that this loss would be accompanied by atrocities and degradation beyond the most savage happenings of the past. It behoves us all, then, who are members of it to show that the British Association, which has rendered such great services to the country in the past, can bear its share of the burden to-day.

It remains to consider the best way in which such a work can be carried out. I suggest that we continue the three Research Committees already in existence, but do not institute a fresh one, forming instead a special committee, the purpose of which I propose to lay before you. Before doing this, I should like to point out that the very fact that engineering constitutes such an important feature of the war has prevented our having, as often in times past, papers on military and naval subjects, such as warships, armour, projectiles, etc. Hence, the 24 papers before the Section deal with engineering science generally; they are of a high scientific quality, and quite as important in character as those of former years, and in several cases they touch closely on subjects bearing on the war, such as those on wireless telegraphy and traction.

The object of the proposed committee is two-fold. The first of these would be to undertake any work which may be of use in an advisory capacity or by research, or, indeed, in any other way for direct assistance in the war. One step will be

to place ourselves at the service of the Ministry of Munitions for such work.

With regard to the second purpose, the matter stands on a rather different footing. We were in many respects quite unprepared for the war on which we have entered, and though this offers one of the most powerful arguments in refutation of the charge that we deliberately entered the war for sinister purposes, it will be very disastrous if we repeat our unpreparedness when the war ceases, and we shall deserve the worst that can happen to us. When peace is concluded, it will only be a prelude to another war, and a war which will recommence with far greater energy on the part of our enemy than before—viz., the war of commerce—and the latter will be almost as serious for us as the more sanguinary one. This will be so even if we are victors, for "after a long war the difficulties of the victors are often greater than those of the conquered. The conquered have their attention directed to the reparation of losses and are inspired by a patriotic desire to submit to losses for the sake of their country. The victors are in the frame of mind which expects everything to be easy."

Remembering how swiftly we relapsed into national ease at the end of the Boer war, it behoves every man who can do so to take his share in making ready for the terrific struggle Germany is certain to put up in the arts and manufactures. We shall better appreciate what this competition will mean if we consider the marvellous progress made by Germany during the last half-century in the arts and manufactures. Although we cannot say that this is absolutely measured by progress in the production of iron and steel, or even say that the corresponding rate of increase in production during that period by this country directly measures our progress relatively to Germany, still it does afford some indication in the case of the engineering industry. The four diagrams, figs. 1, 2, 3, and 4, represent annual production in ordinates and the corresponding years by abscissæ, the production of the United Kingdom being shown throughout in full lines and that of Germany by dotted lines. Taking first fig. 1, we have the actual production of pig iron for the last 50 years, and we can see at a glance the much more rapid rate of comparative production in Germany in recent years. When we come to the percentage relatively to the world's production, we see that while Germany is steadily rising, even in comparison with the whole world output, the production of the United Kingdom is falling at an even more rapid rate than that of Germany is rising; for, whereas 50 years ago it was more than half the production of the whole world, it is now only 13 per cent., whereas Germany's percentage, which 50 years ago was only 10 per cent., has now risen to 25 per cent. of the whole world production.

Figs. 3 and 4 tell the same tale, except that the relative production in steel of this country is now only 10 per cent., Germany keeping for many years the satisfactory figure of a quarter of the whole world's production; and it is, of course, quite familiar matter that, as far as science and discovery go, Germany owes her growth in steel production largely to the discoveries in this country, although in the case of the Bessemer steel process, she evaded the payment of royalties in making use of the invention. We know that the same tale is to be told in many other industries, such, for instance, as the chemical industry, and we are now suffering severely from the want of the very dyes which were invented by one of our own countrymen.

I cannot help recalling the astonishment with which I found in South Africa that, when there was a huge scheme of electrification effected, the enormous amount of material which Germany supplied was for what the public mostly believed to be a purely British enterprise. I also have reason to know that the supply of machinery to New South Wales from Krupp in some cases exceeded by as much as ten times in amount the quantity supplied by British firms. The prices were no higher, in spite of the 5 per cent. advantage to this country. The delivery of the goods was on the one hand sometimes inordinately delayed, though scrupulously punctual in delivery on the other.

Now, when we look closely into the causes of Germany's great advance, we can learn lessons which we have been culpably slow to take to heart. Although there are other causes, first and foremost, and overshadowing all others, is the determined and whole-hearted organisation of German industry. I see it recently stated that the scheme above referred to (the Victoria Falls scheme) was lost to this country because the industrial banks of Germany backed their own manufacturers, and this is no doubt partly true. Germany's power in war is admitted to be her mechanical organisation, and the organisation of every material and engineering force to that end. Just as striking, if not more so, is her organisation for the arts of peace, and I lately heard a very shrewd man of affairs express his amazement at Germany's entrance into war, when by peacefully pursuing the way she was going she would have dominated the world commercially in a few years' time, and, in the words of the speaker, might in many manufactures have made us practically bankrupt. It is undoubtedly in the matter of scientific organisation even more than the organisation of science that Germany has achieved such wonderful results, and it is, therefore, in this direction that we must leave no stone unturned if we wish to have any chance of holding our own in the future.

(To be continued.)

LEGAL.

Manchester Munitions Prosecution.

The Record Electrical Co., Ltd., of Broadheath, near Manchester, summoned at the Manchester Munitions Tribunal, on Wednesday, September 1st, before Mr. P. W. Atkin, Arthur Mantle, of Sale, Cheshire, for leaving work without giving notice, contrary to Sec. 4, Sub-sec. 5, of the Act. The firm's representative said that the company were sub-contractors to other electrical engineering firms, and were indirectly engaged solely on Government war contracts. He admitted, however, that they were not a controlled establishment, but submitted that for all practical purposes the Act applied to their workshops. The complaint against the employé was that on August 27th he suddenly threw up his work without giving notice, his complaint being that the firm refused to pay him the standard rate of 39s. per week, plus war bonus. The reason (continued the firm's spokesman) they declined to do this was because the defendant was only 19 years of age, and he was only entitled to (approximately) 20s. per week. The firm, however, were paying him a good deal more than that, but still he was not satisfied. In the first instance the youth obtained work at their establishment by making a false statement as to his age; he said he was 22, but he was found to be three years younger, by the Union representatives. The action of the defendant had stopped the completion of an important contract for Scotland.

The Chairman said he was afraid the complainants had no jurisdiction, as their place was not a controlled establishment.

The firm's representative replied that a communication had just been received from the Ministry of Munitions ordering them to supply a weekly list of the goods manufactured. It had also been intimated that war badges would be supplied in the course of a few days. To all intents and purposes they were a controlled establishment. He further pointed out that the defendant had not abided by the rules of the Electrical Trades Union, which clearly specified that all complaints should be made through them, and that no stoppage of work should ensue.

Replying to the Chairman, the Defendant said he would not resume work except at the full rates.

The Chairman said that, in view of such a stubborn attitude, the young man would have to "play" for six weeks, and he hoped the firm would not give him a certificate to go elsewhere. Employers in the electrical engineering trades required men of more amenable disposition to work for them.

The case was dismissed on the technical ground that the Court had no jurisdiction.

A Case before the Munitions Tribunal at Blackburn.

At the first sitting of the Munitions Tribunal for Blackburn and District, on September 2nd, Messrs. Dick, Kerr & Co., electrical engineers, Preston, alleged that a workman, Ernest Wilkinson, fitter, of Burnley, had left his employment without permission. Wilkinson said he left Preston because he could not afford to stay there any longer. During the last six weeks he was with the firm he only worked ordinary time. The chairman announced that the case would have to be adjourned, as the firm desired to obtain further information for the Ministry of Munitions. The case was accordingly adjourned.

WAR ITEMS.

Rathenau Optimist and the Turning of the Tables.—We see that Doctor Walther Rathenau has again been delivering an extraordinary speech at an extraordinary meeting of the Allgemeine Electricitäts Gesellschaft. The news comes by telegram *viâ* Amsterdam through the medium of Reuter. Some other remarkable utterances of this gentleman were recorded in the Electrical Review for January 1st, 1915. Really we suppose his remarks would have little concern for us here were it not for the fact that he made them at a meeting of a company which in normal times manufactures chiefly electrical engineering requirements. Now he is, of course, turning out unprecedented quantities of war materials, and is anxious to see the new War Loan of his Hunnish Fatherland a brilliant success. We observe that his company has taken £500,000 of the said loan. That he and his company have had past anxieties regarding raw materials, and that the blockade has really affected his operations, we can well believe, but let his observations in the course of a "highly optimistic speech" speak for themselves:—

"Our anxiety concerning raw materials has completely gone. The blockade no longer affects us. On the contrary, the tables have been completely turned.

"The country which declared a blockade against Germany, hoping to exhaust us industrially and kill us economically, suffers most heavily from its own blockade, while we, in spite of the blockade, are able to continue our immense work, producing unprecedented quantities of war materials.

"We see that Great Britain works hard to raise means for footing bills amounting to thousands of millions, while we who are now used to domestic economy have escaped economic embarrassment, and once more foster the hope that brilliant subscriptions to the new war loan will confirm our independence abroad."

No doubt in due course further references to the speech will come to us through our ordinary channels. Can it be that Walther Rathenau, too, is blinded concerning the small effect of the blockade upon the inhabitants of these islands? The "turning of the tables" will be another interesting operation when the A.E.G., finding its occupation as munition-maker gone, tries to recover its lost export electrical trade. We venture to predict that it will have little assistance from the British Empire, and probably about as much from the Allies when it revives its efforts in that connection. German diplomacy may raise all sorts of confusing issues, but Teutonic traders will not be able to obscure their country's record of systematic barbarism, and they will not be able to wipe out of the recollection of buyers the revelations of trading trickeries that probably nothing but this war would have made before the eyes of the whole world. Let us hear Doctor Walther Rathenau's views on this matter. Even our American friends in their investigations of the South American market have found out the ways of the German banks in disclosing American prices and other secrets for the benefit of German firms. These mean and deceitful practices are referred to on another page of this issue.

Disgruntled Technicists. — The "Higher Technicists" who have been appointed to posts as temporary assistants under the German War Office have expressed some dissatisfaction in the matter of the pay and the uniform accorded to them. The "Higher Technicists" are Herren with college degrees in engineering, chemistry, and so forth. Their services are presumably required in connection with the manufacture of poison gas, baby-slaying explosives, flame-projectors, well-defiling materials, and other contrivances for the propagation of Kultur, and they do not consider that they are either paid or dressed in accordance with their high calling. The Ministry of War has now decided that engineers with university degrees, who are not liable to military service but who are employed by the War Office, are entitled to be treated by the military authorities with the same consideration, and shall wear the same uniform, as qualified civilian medical men in similar employment. But the War Office declines to pay to qualified engineers and architects who are liable to military duty, but who are employed by the Government in their professional capacities, the same salary as is paid to medical men, dentists, and other professional practitioners. The dissatisfied architects and engineers are invited to consider that in being allowed to practice their profession they already enjoy a great advantage over large numbers of educated Germans who are serving as private soldiers. Moreover, while it is comparatively easy for an army to make use of medical men in positions corresponding with their professional dignity, it is not so easy to find similar employment for engineers. —*Ironmonger.*

The Leipzig Fair.—A Reuter dispatch from Amsterdam, quoting the *Vossische Zeitung*, says that at the annual meeting of the Central Committee of Manufacturers concerned in the Leipzig Fair, the President, Councillor Rosenthal, said :—"Attempts by England and France to fight the Leipzig Fair must not be treated lightly. England and France will start their fairs with a State subsidy. Therefore, it is evident that the Leipzig Fair is no longer a matter for Leipzig alone. It is a national question. All interested parties should co-operate with the Empire in maintaining the high standard which the Leipzig Fair has kept up to now."

American Westinghouse Orders.—The *Financier* states that while the American Westinghouse Electric Co.'s biggest war order is for 1,800,000 rifles, its order for shells is an exceedingly important item to the company. The first shell order was for $4,500,000, but the amount has now grown far beyond the expectations of the company when that order was booked. At the rate at which these shells are being handled a profit is estimated of approximately $500,000 a month. "At that rate the present dividend of 4 per cent. on the common stock would be earned about every three months. . . . Westinghouse's rifle manufacturing capacity has been increased to about 6,000 rifles a day by acquisition of the Meriden Arms plant. Apart from the additional capacity this plant gives, is the fact that it offers a supplementary factory on which the company may fall back in case of emergency."

The County Company.—We have already referred to the *Staff War Bulletin* issued by the County of London Electric Supply Co., Ltd., and the splendid way in which the staff and employés are rendering assistance with the Forces. We now learn that the Government have recognised the company as a public service company. In addition to its public utility services, the company is supplying electrical energy for power purposes to a very large number of munition factories and workshops.

The Riots on the Rand.—In connection with the recent anti-German riots on the Rand several firms have commenced actions at law against the fire insurance companies. Amongst others, we note that the A.E.G. Co. are suing the London and Lancashire for £4,000, Alliance Assurance for £3,000, Liverpool and London and Globe for £4,000, Phœnix for £4,000, Royal for £7,000, and Northern for £3,000; also Orenstein, Arthur Koppel & Co. are suing the Union Assurance for £696, the Central for £1,374, the Liverpool and London and Globe for £2,945, and Lloyds for £2,262.

Australia and Enemy Goods.—The *Times* Sydney correspondent states that at the opening of the New South Wales Chamber of Commerce's Exhibition of Manufactures of Enemy Countries and of the Allies, on 1st inst., the Governor, Sir Gerald Strickland, said that though 3 or 4 per cent. more might be paid for articles made by the Allies, it would mean an increase of 30 or 40 per cent. in national security.

BUSINESS NOTES.

Private Arrangements. — William Frederick Lee, electrical engineer, 262, Conway Street, Birkenhead.—The creditors interested herein were called together on August 30th, at the office of Messrs. Moore & Son, solicitors, Birkenhead, when a statement of affairs was presented showing liabilities amounting to £97, and net assets £25, the estate disclosing a deficiency of £72. It was reported that the debtor had been in business for six years, and commenced with a capital of £200, borrowed from his wife. The present position was due to loss on contracts owing to the war, and increase in the price of materials. Debtor was unable to say how much he had drawn out of the business, but thought that it would average between £3 and £4 per week. No accounts had been kept to show how the receipts had been spent. It was decided that the debtor should execute a letter of authority, and that the estate should be realised and the proceeds distributed *pro rata*, the debtor to make a contribution of 5s. a week out of his wages until such time as 5s. in the £ could be procured for the creditors. The following are creditors :—

Drake & Gorham, Ltd., Liverpool	£20
Simplex Conduits, Ltd., Birmingham..	11
Bromell Patents Co., Ltd., Liverpool..	11
Metallic Seamless Tube Co., Ltd., Birmingham	10
Turner, F. J., Birkenhead	11
Handley, William, Birkenhead..	14

Liquidations.—Seear, Scott & Co., Ltd.—This company is winding up voluntarily, with Mr. J. Scott, 17, Lismore Road, Croydon, as liquidator. A meeting of creditors is called for September 15th, at 16-17, Devonshire Square, London.

British Electric Automatic Machines, Ltd.—A meeting of creditors is called for September 22nd, at 1, Broad Street Place, E.C.

G. Straus & Co., Ltd., 211, Upper Thames Street, London, E.C., electrical engineers.—Pursuant to Sec. 188 of the Companies' (Consolidation) Act, a meeting of the creditors of the above was called for Monday last, at 13, Gray's Inn Square, W.C. The shareholders of the company had previously passed a resolution for the voluntary liquidation of the concern, and had appointed Mr. W. J. Colquhoun, the secretary, to act as liquidator. The company was registered in October, 1895, with a nominal capital of £2,000, divided into shares of the face value of £1 each. In all 1,880 shares had been issued, of which 1,370 were issued for cash. The remaining 510 were issued for a consideration other than cash, and were allotted to Mr. G. Straus in payment of the assets of the business which he had formerly carried on, and which he transferred to the company. In June, 1900, debentures for £500 were authorised, and in the following year debentures for £150 were issued. The assets of the company are more than sufficient to discharge the liabilities, and the claims of all the English creditors have been paid in full. The calling of a creditors' meeting is merely a formal matter, necessitated by the decision to wind up the company, and the voluntary liquidation will be continued by the liquidator appointed by the shareholders.

Stoker Contracts.—The following is a list of some of the important orders for stokers recently received by the Underfeed Stoker Co. :—

Corporation of Sheffield electricity station, Neepsend (this makes a total of 28 stokers sold to the Sheffield Corporation), 16 E; Borough of Wigan electricity station, 3 E; Borough of Wolverhampton electricity station (for burning low grade fuel from gas works), 2 A; Borough of Leigh electricity station, 1 E; Corporation of Bury electricity station, 1 E; National Electric Supply Co., Preston, 6 D; South Lancashire Tramways, 1 E; Royal Aircraft Factory, Farnborough (from the War Office), 12 B 5; Lorient Arsenal, France (this is a French Government Arsenal solely engaged on munition work), 4 A; Delaunay Belleville's Works, France (engaged on French Government war work), 4 A; Midland Railway-Carriage and Wagon Co., 2 E; North-British Rubber Co., 6 B 5; Synthetic Products Co., Ltd., 4 B 5; Société Electro Quimica de Flix, 1 E; Central Catalana de Electricidad, Barcelona (these stokers are supplied to enable them to increase the supply of power for war material), 5 A; Société Havraise d'Energie Electric, Havre, 3 A (this concern is largely engaged on French Government purposes), 3 A.

Annual Outing.—Saturday last was the day chosen for the sixth annual outing of the employés of the Brimsdown Lamp Works, Ltd. It was spent with much enjoyment amidst the old-world surroundings of Rye House, in Hertfordshire. After luncheon the toast of the King and Royal Family (proposed by Mr. C. Rice, managing director), was responded to with great enthusiasm, amidst the singing of the National Anthem. Mr. H. C. Sharrar then proposed the toast of the Brimsdown Lamp Works, Ltd., and its managing director. Mr. C. Rice, in replying, reminded those present how necessary it was that in these abnormal times they should all work together. Many difficulties had arisen, but, after all, what were difficulties created for but to be overcome? Many who were with them on the occasion of the last outing were now serving in His Majesty's Forces. He hoped, however, that they would return safely and would be able to join them on the occasion of their next outing. After luncheon a cricket match was played, Ladies *v.* Gentlemen, the gentlemen bowling and fielding left-handed and batting with sticks. The rest of the afternoon was spent in divers ways, some of the party boating, others visiting the places of interest in the neighbourhood. After tea, the evening was occupied by a concert and dance which was held in the Retainers' Hall.

"Hands Across the Sea."—An Australian correspondent writing in July says:—"Your paper comes as a link with the old country and my many friends there."

Bankruptcy Proceedings.—G. J. T. J. Parfitt, consulting electrical engineer, Keynsham.—Last day for receipt of proofs for dividend, September 18th. Trustee, C. H. King, 26, Baldwin Street, Bristol.

Arthur Faraday Hawdon, electrical engineer, Yetholme, Elmfield Gardens, Gosforth, Northumberland.—The first meeting of creditors was held last week at the office of the Official Receiver, 30, Mosley Street, Newcastle-on-Tyne. The Official Receiver reported that the receiving order was made on the petition of a creditor, the Act of Bankruptcy being that the debtor had failed to comply with the requirements of a bankruptcy notice. The debtor's statement of affairs showed liabilities ranking at £543, and assets estimated to produce £50. The failure was attributed by the debtor to the liquidation of a company of which he was managing director. The debtor said that he was unable to put forward any offer of a composition and would consent to adjudication. It was, therefore, resolved that the debtor should be adjudicated bankrupt, and that the Official Receiver should remain trustee.

Brazil.—The Rio de Janeiro French Chamber of Commerce has addressed a letter to all Chambers of Commerce in France, stating that it is prepared to act as a bureau of information for French exporting firms in South America The letter points out that the Chamber has had ocular experience of the means whereby German exporters have achieved their great successes in the industrial and commercial field. They are three:—(1) The organisation of their service of information; (2) their banking organisation, permitting of the allowance of long credits; and (3) their incomparable pliability and power of adaptation to the exigencies of their trade. To fill the first-named deficiency in French trading methods, the Chamber offers its services to French exporting firms.—*La Lumière Electrique.*

Catalogues and Lists.—Messrs. Cookson & Co., 25, New Oxford Street, London, W.C.—Revised price leaflet of accessories for the accumulator trade (i.r. corks and collars, glass vents, and hydrometers).

Bastian Electric Heating Syndicate, Ltd., 185, Wardour Street, London, W.—Illustrated catalogue of 32 pages containing particulars and prices of Bastian glowers, metal bus-bars, various types of heaters, ovens, the Pyrostove, electric geyser, flatirons, &c. The prices are now subject to a uniform trade discount instead of the varying rate previously obtaining. The alteration dates from September 14th.

Messrs. Belling & Co., Edmonton, N. — Illustrated folder giving descriptions, illustrations and prices of various patterns of Belling electric fires. The folder is described as a "temporary leaflet" for the 1915-16 season, and it has a space left for the imprint of the contractor or tradesman circulating it.

Messrs. Musgrave & Co., Ltd., St. Ann's Ironworks, Belfast. —Postal card giving prices and other particulars of their slow-combustion stoves and air-warmers for workshop heating.

Trade Announcements.—Messrs. W. & R. Jacobs have removed from King William Street (where they have been established for eight years) to larger premises at 94, Leonard Street, Finsbury, where offices and works are under one roof.

Messrs. Bergtheil & Young, Ltd., have changed the name of the company to Berkeley & Young, Ltd. The company has been in existence in the City of London for 23 years.

Book Notices.—"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXIV, No. 8. August, 1915. New York: The Institute. Price $1.

"*Proceedings* of the American Society of Civil Engineers." Vol. XLI, No. 6. August, 1915. The Society. $8 per annum.

"The Wireless Telegraphist's Pocket-Book." By J. A. Fleming. London: The Wireless Press. Price 6s. net.

"The Standard Handbook for Electrical Engineers." London: Hill Publishing Co., Ltd. Price 21s. net.

Patent Application.—Messrs. Heenan & Froude, Ltd., and H. N. Leash have applied for the restoration of Patent No. 16,237 of 1910, and Patent of Addition No. 29,638 of 1910, granted to H. N. Leash for "Improvements in charging doors for furnaces."

Meters Approved.—The Board of Trade has approved of the Murday recording voltmeter, types M.R. 1 and M.R. 2, deposited in August last by Messrs. Evershed & Vignoles, for use in testing stations for testing electrical pressure when supplied on the constant pressure C.C. and A.C. systems respectively.

For Sale.—Messrs. Edwards, Son & Bigwood will sell by auction, on September 21st to 24th, the goodwill, patents, &c., and stock-in-trade of the British Prometheus Co., Ltd., in liquidation, also electrical appliance manufacturers' plant, machinery and tools, including a gas engine and 66-KW., one-phase, A.C. generator. Particulars are given in our advertisement pages.

LIGHTING and POWER NOTES.

Aberdeen.—The accounts of the Corporation electricity department for the year show that the sale of current realised £56,740, as compared with £56,809, and the hire of motors £3,326, as against £2 889. On the expenditure side the generation of electricity cost £16,029, as compared with £17,711 last year; distribution costs were £1,226, as against £874. The revenue and expenditure account amounted to £60,231, a balance of £32,222 having been carried to the net revenue account. The quantity of electricity generated amounted to 12,475,920 B.T. units, this being a record and exceeding last year's quantity by 781,925 units.

Accrington.—In view of the desire for economy the question of discontinuing the electricity showroom has been referred to a sub-Committee.

Amble.—Proposed E.L.—The U.D.C. has instructed the surveyor to prepare estimates for public lighting by electricity. The Council recently asked the Gas Co. to supply by meter, but it refused, and stated that it could only supply gas for public lighting at a lump sum of £200 a year. The Council, considering it was not justified in accepting these terms, has applied to the Broomhill Collieries, Ltd., for a supply of electricity, the Council being empowered to undertake the distribution of current for public and private purposes under Sec. 161 of the Public Health Act, 1875.

Argentina.—The new electric power station at Castelli (Province of Buenos Ayres) was inaugurated recently. The concessionaire is Senor Antinori.

The "Argentine Brighton" is threatened with darkness. In other words, Mar del Plata's electric light supply is likely to be cut off, like that of an ordinary citizen, and for the same usual reason, non-payment. The Municipal Commissioner has applied to the President of the "Club Mar del Plata" for help in this emergency; the amount owing by the community to the electric light company comes to about $124,000 m/n. In reply to an application of the local board for funds with which to purchase coal, instructions have been received for the company to suspend operations. To get over the difficulty the club is invited to assume an obligation of the municipality for the sum of $47,272 m/n, representing electric supply during the months June to December, 1913. Since 1913 the municipality has only paid $23,213 "on account," which amount corresponds to the supplies during January and February, 1914, and $32,868 m/n. during the current year.—*Review of the River Plate.*

Australia.—The South Brisbane City Council has under consideration an application for permission to supply the city with electric light and power.

A scheme has been submitted to the Minister of Public Works for New South Wales for utilising the water supply system of Grafton and South Grafton in connection with a hydro-electric power scheme.

The Cottesloe (W.A.) Council proposes raising a loan of £11,000, a portion of which is to be expended in extending the electric light.—*Tenders.*

Bacup.—Street Lighting.—The Electricity and Tramways Committee has decided to accede to a request of the Lighting Committee that double-time switches should be installed on alternate lamps in Todmorden Road. The electric lighting of Todmorden Road is now practically completed.

Blackpool.—Hospital Supply.—The T.C. has read a letter from Lord Derby relating to the provision of electrical massage treatment at the large Convalescent Hospital at South Shore. He said the necessary appliances would cost about £500, whilst the working expenses would reach from £3,000 to £4,000 a year additional to the amount that the War Office was spending on the hospital. The Council decided to defray the cost of equipment, and to supply electric current for the treatment free of charge.

Bolton.—Coal Siding.—The Electricity Committee has instructed the electrical engineer to arrange with the L. & Y. Railway Co. for the construction of a coal siding from the railway to the new electricity works at Back-o'-th'-Bank.

Bury.—Loan Sanction.—The L.G.B. has sanctioned the borrowing by the Corporation of £7,225 for additional equipment at the Chamber Hall electricity generating station.

Canada.—The American Consul at Fort William, Ontario, in a recent report, states:—It is reported that the water power of the Nipigon River, on the north shore of Lake Superior, is one of the largest of the undeveloped accessible water powers in Canada. Of the total descent nearly 175 ft. could probably be utilised. The Hydro-electric Commission of Ontario reports as to the power available at the different localities along the river, as follows:—Cameron Rapids, 19,500 H.P.; Splitrock, 7,500 H.P.; Island Portage, 4,750 H.P.; White Chute, 6,000 H.P.; Victoria Rapids, 5,000 H.P.; Camp Minor Rapids, 3,500 H.P.; Virgin Falls, 12,500 H.P.; Flatrock, 19,000 H.P. The report further states that Lake Nipigon could be converted into an excellent storage basin rendering it possible to increase the rate of flow above the minimum figures given in the report of the commission. Power plants at Cameron Pool and Virgin Falls would be about 85 miles from Port Arthur.

Connah's Quay.—Prov. Order.—The U.D.C. has been granted a prov. order for E.L., but it cannot be proceeded with until after the termination of the war.

Denny.—Proposed Price Increase.—At a recent meeting of the T.C. a letter was submitted from the Scottish Central Electric Power Co. intimating an increase in rates for electrical energy. It was decided to point out that the Council had a contract, under which rates were fixed for a period of 15 years, and that it declined to agree to the increase.

Dewsbury.—Annual Accounts.—Figures relating to the electricity department for the year ending March 31st last show receipts amounting to £14,950, as against £13,875 during the preceding year, whilst the expenditure was £7,439, against £7,077 a year ago. After deducting payments to the depreciation and renewal fund account, &c., there was a balance of £1,819, of which £1,347 is carried forward to next year. The number of units sold during the year was 1,949,026, as against 1,733,137 during the preceding 12 months, including 449,171 for lighting purposes; 887,039 for power and heating; 552,854 for traction (Yorkshire Woollen District); and 59,962 for the National Electric Construction Co. The increase of, roundly, 200,000 units, is accounted for by the enlarged supply of energy to mills, workshops, &c., for power and heating purposes. Although the total units increased by 12·45 per cent., 181 tons of coal less than last year were used, the coal cost per unit being about the lowest in the country for a similar output and a record for the undertaking.

Eccles.—Price Increase.—The Public Lighting and Electricity Committee has resolved to increase the charges for the supply of energy as from October 1st next, by 10 per cent. for private and public lighting, and by 20 per cent. for general power, heating and cooking. The L.G.B. has refused the T.C.'s application for the raising of further loans for extensions to electricity mains, services, &c., for ordinary purposes.

Guildford.—Price Increase.—The local Electricity Supply Co. has intimated that the price of electricity will be increased by 10 per cent. for lighting and by 20 per cent. for heating, cooking and power, as from September 30th next.

Hoylandswaine.—Proposed E.L.—The U.D.C. has deferred consideration of the proposal of the Electrical Distribution of Yorkshire, Ltd., to apply to the B. of T. for a provisional order to provide electric lighting in the Council's district. It was stated that the charges would be on a sliding scale, from 1½d. per unit for street lighting to 5d. per unit for house lighting, with a maximum price of 7d.

India.—Electrical Pumping.—The success which is attending the electrical pumping experiments in the Amritsar district is attracting attention in Simla. The value for irrigation purposes of the water raised by this method affords, it is found, a very fair return upon the cost of installing and working the electrical pumping machinery, and, by the method adopted at Amritsar, not only can waterlogging and consequent malaria be reduced, but also canal irrigation can be extended, inasmuch as the water originally brought to the canals is made to do duty a number of times over, the result being that the amount of water taken from the canals for local irrigation can be reduced, leaving an increased supply of canal water for distribution to areas which could not otherwise have been supplied.—*Indian Engineering.*

Simla Extensions.—Owing to the large number of applications for electricity, the Simla Municipality is now extending the area of supply considerably. The work is well in hand, and bigger transformers are being installed in all the sub-stations in Simla, while at Chabba arrangements are being made for the erection of a new 500-K.V.A. alternator, which is expected to arrive shortly. The scheme includes the fitting up and supplying of energy at one rupee per lamp per month up to a maximum of five lamps, whether the consumer uses it by day or by night, and quite a large number of shopkeepers on The Mall are already availing themselves of it. —*Indian Engineering.*

Killorglin (Co. Kerry).—Mr. Thos. O'Donnell, M.P., is one of the promoters of the Killorglin Electric Light and Power Co., which has been registered with a nominal capital of £1,650 in £1 shares.

Middleton.—Year's Working.—The loss on the electricity undertaking for the past year is £429, which has been transferred to profit and loss account, increasing the debit balance to £2,244.

New Zealand.—The Lyttleton B.C. has approved of the principle of lighting the borough with electricity, and a poll of the ratepayers is to be taken on the proposal to carry out the scheme.

The Dominion Cement Co., of New Zealand, is installing a complete hydro-electric generating plant, with sub-station equipment. The power house at Wairua will contain two water-wheel-driven A.C. generators of 1,250 K.V.A., at 50 cycles, 500 R.P.M., 5,500 volts, and two D.C. generators of 30 KW., at 1,000 R.P.M., 230 volts; the pressure will be stepped up to 22,000 volts for transmission.

The Takapuna B.C. has received an application from the Tramway and Ferry Co. for a concession to supply the borough with electric light and power on terms to be arranged; the recently-appointed Electric Lighting Committee has been instructed to obtain full information, and report to the Council.

Devonport (N.Z.).—The Council has received an offer from the Electricity Supply Corporation (N.Z.), Ltd., to light the streets by electricity. The company would install 167 lamps of 100 C.P., 10 of 300 C.P., six of 1,000 C.P., and three of 2,000 C.P. The charges to the Council for lighting and maintenance would be approximately £813, as against £380 paid at present for gas. A discount of 3¾ per cent. is offered if 8,000 C.P. is taken as a first instalment. The matter has been referred to the Works Committee with instructions to select two areas in which demonstrations could be carried out by the gas and electricity companies over a period of three months. The Council has accepted the Electricity Supply Corporation's offer to supply electric power for operating the Council's stone-crushing plant.—*Tenders.*

Plymouth.—Year's Working.—The annual report of the Electricity and Street Lighting Committee shows that the Prince Rock works made a gross profit of £15,042, as against £15,529 in the previous year, which has been appropriated as follows:—Expenditure on mains, &c., £2,624; dividends and interest, £4,755; income-tax, £1,478; stock and mortgages redemption, £4,090; and repayment of loans, £1,441; leaving a net profit of £981, of which £442 has been placed to reserve fund and £539 applied in aid of the rates. In the preceding year the net profits amounted to £3,028; the reduction is accounted for by the large expenditure on mains out of revenue, the increased price of coal, and the heavier income-tax charges. At the Newport Street works the gross profit for the year has been £10,164, compared with £7,878, which has been appropriated as follows:—Dividends and interest, £4,071; stock and mortgages redemption, £4,766; income-tax, £11; and interest on deposits, £15; making total payments of £8,864, and leaving a net profit of £1,299, which has been transferred to reserve fund. In the preceding year the net profit was £46.

Rochdale.—Following a report by the borough electrical engineer as to the difficulty experienced in keeping men at the electricity works—many employés having left to make munitions—the E.L. Committee has decided to apply to the Minister of Munitions for recognition of the electricity works as being engaged on Government work.

Shipley.—At the last meeting of the U.D.C. attention was directed to a draft agreement submitted by the Bradford Corporation in regard to the supply of electricity to Dumb Mills, Frizinghall. It was pointed out that this agreement was the same as a previous one which the Council refused to sign, and, in view of this fact, the clerk was instructed to prepare a draft agreement for submission to the Corporation embodying the terms desired by the Council. It was stated that the Council would not give way in the slightest degree until it got from the Corporation what it demanded.

South Africa.—Proposed Loan Application.—A ratepayers' meeting was held at Cape Town, on August 18th, for the purpose of obtaining sanction to the loan of £75,000 for the extensions to the electric lighting plant. The following figures were given by the chairman of the Electric Lighting Committee as a justification for the proposed expenditure: number of consumers in 1913, 5,533; 1914, 7,176; seven months of 1915, 7,738, equal to an increase of 40 per cent. over 1913. The increase in 1915 would have been much larger, but for the suspension of the free-wiring facilities. The revenue in 1913 was £101,131, and in 1914, £116 330; the estimated revenue for 1915 was £124,868, which would in all probability be exceeded, as the returns for the period January to July showed an increase of 18 per cent. over the corresponding period of 1914; units sold 1913, 7,469,000; 1914, 9,349,000; for the first seven months of 1915 the units generated showed an increase of 22 per cent. over a similar period of last year. For the relief of rates in 1913 £4,680 was available, and in 1914 £10,471; for 1915 the net profit was estimated at £19,571, which on the basis of returns to date would be materially increased. The maximum load this year was nearly equal to the full capacity of the two 2,000-KW. turbines installed and was steadily going up, and they would also shortly have to meet a new demand for 800 KW. for Government requirements. The only stand-by plant was the old reciprocating plant of about 2,600-KW. capacity. Owing to the increasing demand it was necessary that the plant should be supplemented without delay. The distributing system in many parts of the city was also becoming overloaded and inadequate; it was estimated that the £75,000 would cover capital expenditure for the next two years. The resolution sanctioning the application for a loan was carried.

Pietermaritzburg.—The borough electrical engineer reports that the revenue from private lighting and power shows a substantial increase over that of last year, the number of new connections during the year being up to the average. The new turbine plant which has now been working for some 16 months has enabled the department to deal with a greatly increased demand, while at the same time effecting economies in the generating costs. On June 25th the number of units generated during the 24 hours was 10,400, an increase of 25 per cent. on the corresponding day of last year, when the output was 8,214 units. With the increasing demand the question of additional plant would shortly have to be considered. The steam alternators and stand-by boiler plant had been overhauled. The agreement with the railway department expires at the New Year, and it will be necessary for the Council to consider the conditions of its renewal.—*South African Mining Journal.*

South Wales.—MINERS' LAMPS.—According to the *Standard*, a portion of the South Wales coalfield has agreed to use electric lamps instead of Davy lamps, in order to minimise the risk; coal cutters who use them are offered 1d. per ton extra.

St. Annes.—BULK SUPPLY.—The D.C. has signed the agreement to provide Lytham with a bulk supply of electricity, but the L.G.B. has announced that it cannot sanction a loan for the purpose at present.

Stockport.—PLANT EXTENSION.—The electrical engineer having reported to the Electricity Committee that it would be some weeks before the new plant on order would be at work, two condensers are to be put down, at an approximate cost of £600, so that the output of the present plant can be increased.

Swansea.—PRICE INCREASE.—The borough electrical engineer reports that owing to the war, the extra cost of production for the year ending March next will be £4,420, viz., £2,000 for coal (40 per cent. increase), £752 for men on military service, £468 war bonus to employés, and £1,200 extra cost of material, &c. To meet this extra expenditure he recommends that the hours of maximum demand be increased in the winter quarter from 91 to 137, that the flat rate in connection with the maximum demand system be discontinued, that meter rent ranging from 2s. to 10s. per quarter be charged, that the minimum charge per service be 5s. for each summer quarter and 10s. for each winter quarter, and that the extra cost (£517) of carbons, globes, &c., be charged to public lighting. It was stated that these changes would provide an estimated increased revenue of £3,300, and that it would be the first time that Swansea had charged a meter rent. The report was adopted, and the question of a proposed showroom was referred to a Sub-Committee.

Trowbridge.—OVERHEAD LINES.—Provided that underground cables are laid in the main streets of the town, the U.D.C. has decided to raise no objection to the Electric Supply Co. using overhead lines in the side streets and outlying districts, according to a plan to be prepared by the surveyor.

TRAMWAY and RAILWAY NOTES.

Accrington.—TRAMWORKERS' WAGES.—The Corporation has refused a request by the men's Union to pay all men in the tramway department at the rate of time and a half for time worked on Saturdays over and above their ordinary duty.

Burnley.—WAR BONUS.—An application for a war bonus of 3s. per week for local tramway workers has been referred to the General Purposes Committee of the Corporation; the Tramways Committee has refused an application from the shed labourers.

Continental.—SICILIAN RAILWAY ELECTRIFICATION.—A Milan syndicate has submitted to the Italian Government a scheme for the electrification of the light railways on the Island of Sicily, the total length of which is about 625 miles. According to the project, the necessary current would be taken from the generating station of the Societa Elettrica della Sicillie Orientale, and converted from three-phase to single-phase current at 50,000 volts at a large converting station to be established at Nicosia. Fourteen transformer and distributing stations would also be established along the railways, where the voltage would be transformed to a working pressure of 11,000 volts.

Dartford.—The Tramways Committee has reported that the Chief Commissioner of Police has issued summonses against the tramway manager for employing unlicensed conductors. The Chief Commissioner, the report explains, will not issue licences to persons under 21 years of age, and the clerk has been instructed to suggest to Messrs. Balfour, Beatty & Co., Ltd. (the tramway lessees), that unless the Chief Commissioner will relax the rule for the period of the war, they should lay the whole of the facts before the Minister of Munitions, and inform him that it will be impossible for them to provide proper facilities for conveying workmen to local works.

Glasgow.—ELECTRIC VEHICLES.—The members who attended the Conference of sanitary inspectors in London reported to the T.C. that they had inspected various kinds of vehicles constructed for cleansing work, particularly electric vehicles for refuse collection, and were of opinion that there was a promising future for electric vehicles, particularly for the collection of refuse, &c., and considered that the development of this class of vehicle should be carefully watched.

ROAD WIDENING.—The B. of T. has been in communication with the Tramways Committee on the working of the single line of tramway at Spier's Bridge, Thornliebank, and has pointed out that while the Board can accept no responsibility for a line used without its sanction, it does not propose to take any further action in the matter at present, on the understanding that the Corporation will take the earliest opportunity to obtain Parliamentary powers to purchase the land necessary for the widening. The Committee has agreed to recommend the T.C. to include in the prov. order the necessary clauses suggested by the Board.

BULK SUPPLY.—Owing to the postponement of all extensions of plant and buildings at the electricity department the Tramways Committee, at the request of the Corporation electrical engineer, agreed to assist the electricity department during the coming and succeeding winters by supplying energy from the Pinkston power station to Port Dundas.

London.—L.C.C. ANNUAL ACCOUNTS.—The year's working of the London County Council tramway undertaking—to which reference was made in our issue of April 30th last—resulted in a total income of £2,399,847 (£2,389,046 electric); working expenses amounted to £1,700,571 (£1,684,243 electric); and the surplus was £704,803 (electric); after meeting a deficiency of £5,526 on horse traction, a balance (gross profit) of £699,276 remained. As against this, debt charges, income-tax, Parliamentary expenses, &c., less certain deductions, totalled £732,448, leaving a net deficiency for the year of £33,173, which was met out of the general reserve fund.

By electric traction 58,706,161 car-miles were run, the total, including horse cars, being nearly 59 million car-miles; 547,253,332 passengers were carried by electric cars and 550,597,993 passengers in total. This compares with 522,952,600 passengers in the previous year and 512,652,700 in 1912-13. It is interesting to note that 41 per cent. of the total were 1d. fares and 29 per cent. ½d. fares.

The total revenue averaged 9·77d. per car-mile, as against 9·21d. in 1913-14; working expenses totalled 6·89d. (including war service allowances), as against 6·50d. in the previous year, when no such allowances were made, and included 1·02d. per car-mile for power expenses, exclusive of debt charges.

For power purposes, 143,393,600 units were generated at a total cost of ·396d. per unit (including ·31d. working expenses and ·086d. debt charges).

Sub-station and distribution costs, including debt charges, amounted to ·195d. per unit, the energy dealt with including, in addition to the above, nearly 14 million purchased A.C. units (costing ·577d. per unit); there were also purchased 325,396 D.C. units at ·854d. per unit—the total units generated and purchased amounting to 157,680,899.

The units used for traction, including transmission and conversion losses, totalled 152,666,477, at an average cost of ·615d. per unit, the balance being used for car and repair sheds and for auxiliary plant. The L.C.C. tramway system extends over practically 150 miles of streets, and includes 5·7 miles horse traction, 121 miles of conduit, and 20·28 miles of overhead trolley electric route; 2·79 miles of overhead route were, in addition, worked by the Metropolitan Electric Tramways, Ltd.; 1,767 cars were in use, including 16 trailer, 3 petrol-electric and 37 horse cars.

During the year one of the reciprocating sets at the Greenwich generating station was replaced by the first new 8,000-KW. turbo-generator, some of the switchgear was reconstructed and additional safety devices were introduced. The work was generally carried out without interference with the supply of power, but unfortunately on December 11th, 1914, a transformer, which exploded, caused a serious fire and consequent interruption of the supply.

The improvement in the price of coal at the commencement of the year was not maintained, owing to the partial closing of the Firth of Forth, the restricted output, and also to the increased rates for freight and insurance. Large quantities of coal had to be purchased at enhanced prices outside the contracts.

The total amount charged against the capital account of the tramway undertaking to March 31st, 1915, in respect of street improvements was £714,351. The charge against revenue account for the year in respect of this capital was £35,940, an increase of approximately £5 000 over the charge of the previous year.

During the period under review sums amounting to £87,828 were paid to the local authorities in respect of rates levied on permanent way, an increase of £1,500 on the year 1913-14; the rates on the power station, car-sheds, &c., were, in addition, £40,207. The various road authorities through whose districts tramways operate have, it is estimated, effected a saving of at least £134,400 during the year by the Council paving and maintaining the tramway area.

In June, 1908, the Council decided that during a period of five years any balance remaining after providing for renewals should be carried to general reserve; this fund amounted to £196,223, and deducting the deficiency for the year, a balance remained of £163,050.

The renewals fund amounted to £543,859; £141,813 was spent during the year, leaving a balance of £402,045.

South Shields.—YEAR'S WORKING.—For the year ended March 31st last, the Corporation tramways carried 10,479,421 passengers and ran 927,728 car-miles, increases of 474,257 passengers and 29,713 miles, respectively. The total revenue was £39,845, and the gross balance £14,335, leaving after meeting interest and sinking fund charges a net balance of £5,594. Compared with the previous year, the revenue was somewhat higher, but owing to a considerable increase in working expenses, the disposable net balance was about £1,500 less. The working of the Edison battery 'buses resulted in 156,203 passengers being carried and 22,197 car-miles being run, the receipts amounting to 6·55d. per c.m. Over 39,000 units were supplied for the 'bus service; and the total energy used for the cars, workshops, and 'buses, amounted to 1,220,313 units. The net balance on the year's working was appropriated as to £3,194 to reserve and £2,400 in aid of the rates. The total of the reserve fund now amounts to £28,838.

Manchester.—Tramway Accident.—On the night of the 3rd inst. a Corporation car overturned at the junction of Alexandria Road South and Wilbraham Road.

At a Board of Trade inquiry on Wednesday into the accident, evidence was given that the track and the car were in perfect condition, but that the place where the accident occurred was not illuminated as the Tramways Committee would wish; and Mr. McElroy, general manager, said that in his opinion the accident would never have happened if a lamp on the east side had been lit instead of one on the other side. Lieut.-Colonel Von Donop closed the inquiry.

The first women conductors in the city were put to work experimentally on Wednesday.

Mexborough and Swinton.—Railless Traction.—Last week the B of T. inspected the new railless traction routes of the Mexborough and Swinton Tramways Co., and a commencement was made with the carrying of passengers. There are two sections, from the junction of Swinton Road and High Street, Mexborough, to the Manvers Main Colliery, and from the Mexborough Toll Bar to Elm Green, Conisborough.

Reading.—After considering the tramway manager's report as to restricting the expenditure during the war, the Committee has decided to inform the Council that the cost of working the undertaking cannot be reduced if the present car services are maintained.

Rochdale.—Following the breakdown of the arrangement with the contractors for the work of erecting the new car-shed, the Corporation Finance Committee has decided to advance the necessary money to enable the shell of the extensions to be completed and covered in.

Salford.—Annual Accounts.—During the year ended March 31st the Corporation tramways ran 5,828,232 car-miles, some 400,000 miles less, and carried 54,343,908 passengers, or 1,219,362 more than in the previous year. The total income was £262,454, and the gross profit (after deducting working expenses and £6,226 war allowances) amounted to £85,706. The balance of the year's working, after meeting all the usual charges, was £32,264, as against £26,450 the previous year, and was appropriated as to £22,000 to the relief of rates, and £10,264 to the renewals fund. The total number of units used was 9,602,534; average total revenue per car-mile, 10·807d.; average working expenses, including energy cost per car-mile, 7·022d. The balance of the depreciation and renewals fund amounts to £27,573.

Stockport.—The Chairman of the Tramways Committee reported to his Committee that he had been informed that the Electricity Committee had decided to give notice that it might be necessary to curtail the supply of electricity for tramway purposes. He suggested that the Committee should draw the attention of the Electricity Committee to the fact "that the Tramways Committee are not customers but partners in the electricity works, both as a department of the Corporation and as owners of the plant therein in excess of the tramway requirements." The terms of the resolution were plainly put, "so that there may be no misapprehension as to the ownership," the Tramways Committee deciding that it would not, except by consent, accept any cutting down of the tramway service.

Warrington.—Motor-'Bus Service.—The Electricity and Tramways Committee has decided not to accede to requests that motor-'bus services should be inaugurated to Winwick and Thelwall, where military hospitals are situated.

The Corporation motor-'bus drivers are to receive a bonus of 1s. per week when they average six miles to the gallon, and an extra 1s. per week when the average is 6½ miles or over. The idea of the bonuses is to encourage the men to save petrol.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—October 25th. Six electrically-operated wharf capstans, for the Sydney Harbour Trust. Forms of tender from the Engineer-in-Chief, Harbour Trust Offices, Circular Quay.*

October 25th. For the Commonwealth Department of Defence (Navy Office). Supply, delivery and erection of power-station plant and equipment for the Commonwealth Naval Dockyard, Sydney.*

Hawthorn.—November 30th. Refuse destructor plant, for the Hawthorn-Malvern-Camberwell and Kew Destructor Trust. Specification from the Trust Engineer's Office, Town Hall.

Bristol.—September 24th. Unwashed small coal for six or twelve months, for the Corporation electricity works. Mr. H. F. Proctor, Chief Engineer and General Manager, Exchange, Corn Street (returnable deposit of £2 2s.).

Burnley.—September 20th. B. of G. Electrical goods. Tender forms from Mr. J. S. Horn, Clerk.

Castletown-Bere.—The District Council has called for tenders for the public lighting of the town by electricity for a term of 15 years.

Edinburgh.—October 4th. Corporation. Cast-iron intake shaft, pump shaft, &c., for obtaining sea-water for condensing in connection with the new electricity station at West Bank, Portobello. The Engineer, Dewar Place station, Edinburgh.

London.—Bow.—September 21st. Electrical goods for the managers of the Poplar and Stepney Sick Asylum District. Mr. S. G. Wright, Clerk, the Asylum, Devon's Road, Bow, E.

Kensington.—September 23rd. Six months' supply of electric lamps and fittings for the B. of G. of Kensington Parish. Tender forms from Mr. W. R. Stephens, Clerk, Guardians' Offices, Marloes Road, W.

Newport (Mon.).—Converter plant and transformers, for the Corporation. Mr. A. N. Moore, Borough Electrical Engineer, Town Hall.

New Zealand.—Dunedin.—November 3rd. City Council. Supply and delivery of insulated and bare copper wire in quantities for a period of two years. Specifications at Electrical Engineer's office, Market Street, Dunedin.—*New Zealand Shipping and Commerce.*

Reigate.—September 13th. T.C. Twelve months' supply of A.C. induction motor meters. See "Official Notices" September 3rd.

Shanghai.—September 24th. Municipal Council. One turbo-generator, 5,000 KW., and one or two of 10,000 KW., complete with condensing plant, &c. See "Official Notices" August 20th.

September 29th. E.H.T. switchgear, static transformers, and underground cables for 22,000 v., for the Municipal Council. See "Official Notices" August 27th.

Stanley.—General repair and upkeep of the electric bells in Newton Hill and Stanley Council New Schools. Mr. A. Angus, West Riding Education Office, Wakefield.

South Africa.—Johannesburg.—September 25th. For the T.C. Two turbo-alternator sets, condensing plant, switchgear, &c. Specification, &c., on deposit of £2 2s., from Mr. J. H. Dobson, General Manager.*

September 25th. Municipal Council. 1,595 electricity meters and 50 time switches.*

October 9th. Municipal Council. Water-purifying plant with a capacity of 75,000 gallons per 24 hours, for the generating station.*

Swindon.—September 18th. Corporation. Supply of steam coal. See "Official Notices" September 3rd.

Wakefield.—Coal for one year from October 9th, 1915, for Yorkshire (West Riding) Electric Tramways Co., Ltd., Belle Isle. Tenders to H. England, General Manager.

Warrington.—September 22nd. B. of G. Electrical goods ("none of German or Austrian origin") for six months ending March 31st, 1916. Tender forms from Mr. Arthur Bottomley, Clerk, Bewsey Chambers.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Australia.—The following contracts have been placed:—

Victorian Railways.

Construction of sub-station at North Fitzroy.—Swanson Bros., £15,740.

Carbons.—Item 1, £7 8s per 1,000; item 2, £7 16s. 9d. per 1,000; item 3, £8 9s. 10d. per 1,000; item 4, £9 2s. 10d. per 1,000; item 5, £9 15s. 11d. per 1,000; item 6, £10 9s. per 1,000.—W. McLean & Co.

Two air-compressors, £335 each.—Belliss & Morcom, Ltd.

H.T. two-core concentric cable, per mile: 7/16, £207; 7/14, £261; 19/16, £340. L.T. two-core cable, per mile: 7/16, £147; 19/14, £386. Ditto three-core cable, per mile: 7/14, £261; 19/14, £531.—B.I. & Helsby Cables, Ltd.

Two motor-driven air-compressors with spare parts, for the Jolimont car shop; four ditto, including motors, for the Ballarat and Bendigo workshops, £3,462.—Belliss & Morcom, Ltd.

Hawthorn Tramways Trust.

Construction of the permanent-way for the electric tramway from Melbourne to Burwood, £55,065.—H. Teesdale Smith. The tender of the Trust's engineer to do the work by day labour exceeded the accepted tender by £6,000.

Sydney Harbour Trust.

Electric power wool-bale elevators and conveyors, Wooloomooloo Bay sheds.—Gibson, Battle & Co., Ltd.

Sydney City Council.

Two arcing ground suppressors complete, for 33,000-volt 50-cycle circuits, £1,510.—Aust. General Electric Co.

Bare copper cable: 7/16, 5,000 yd.; 7/14, 300,000 yd.; 19/16, 150,000 yd.; 19/14, 200,000 yd.; £18,050, subject to the metal market, as provided by agreement.—B.I. & Helsby Cables, Ltd.

For the supply of 33,000-volt cables (Specification No. 374) the following tenders were received:—

	Schedule A, with copper sheath.	Schedule B. without copper sheath.
Noyes Bros.	£18,300	£17,050
W. T. Henley's, Ltd.	18,771	16,809
Siemens Bros. & Co.	18,9·0	17,770
B.I. & Helsby Cables, Ltd.	19,125	17,941
Western Electric Co.	19,291	17,642
British General Electric Co.	20,560	—
Aust. General Electric Co.	21,663	18,900
Lawrence & Hanson	25,875	23,625
N. Guthridge, Ltd.	38,252	35,162

The tender of Messrs. Noyes Bros. (Schedule B), at £17,050, was recommended for acceptance.

Melbourne City Council.

Cast-iron service and cut-out boxes.—Commonwealth Cast & Malleable Iron Works.
One turbine-driven boiler feed pump, £467.—H. Perks.
Four three-phase transformers, £612.—Johnson & Phillips.
Condenser fuses.—McIlwraith & Co.
Insulators.—Commonwealth Art Pottery & Insulator Co.

Commonwealth P.M.G.'s Department.

Two generators at £348 18s. each, and two transformers, £105 each, for the radio-telegraph stations at Townsville and Woodlark Island.—G. Weymouth & Co. Pty.

Victorian State Coal Mine.

H.D. copper wire, 7/18, £17 17s. 6d. per mile.—B.I. & Helsby Cables, Ltd.

—*Tenders.*

Dartford.—In view of the advice of the Board of Trade, the T.C. Electricity Committee has decided to store 1,000 tons of coal, and recommends the acceptance of the following tenders :—

J. Waddell & Sons, Ltd.—500 tons Yorkshire Main, 24s. 6d. per ton.
Myers, Rose & Co., Ltd.—500 tons Yorkshire nutty slack, 21s. 9d. per ton; 500 tons Notts Mansfield slack, 20s. 9d. per ton.

The firms will be asked if they are willing to extend the contract for six months.

Glasgow.—The Clyde Navigation Trustees have accepted the offer of Messrs. Johnson & Phillips, Ltd., for the supply of cables for the capstans in connection with the electric crane being erected at Queen's Dock. The Tramways Committee recommends for acceptance the offer of the British Westinghouse Co. for a supply of motor armature coils.

Liverpool.—The T.C. has accepted the tender of Messrs. Spurrier, Glazebrook & Co., Ltd., for lubricating oils for the Electricity Supply Department for a period of seven months.

Middleton.—The Electricity Committee has accepted the tender of Mr. J. Hulbert for six months' supply of coal to the electricity works.

Salford.—The Corporation has sealed an agreement with Mr. Bertram Thomas for the supply of switchgear required for a rotary converter at the works of the Broughton Copper Co.

Stockport.—The following tenders have been accepted by the Electricity Committee :—

Iron stanchion for new boiler installation.—H. Parkes & Nephew, £27.
New I.P. cylinder for No. 4 engine.—Belliss & Morcom, Ltd, £95, less 10 per cent.

The Tramways Committee has accepted the following :—

One ton of mild-steel fishbolts and nuts.—Hadfield's Steel Foundry, Ltd, £21 10s.
20 gallons shellac varnish.—J. C. Arnfield & Co.
Wheels and axles.—John Baker & Co. (Rotherham), Ltd.
Gold leaf.—Coe Ribbon Gold Leaf Manufacturing Co.
Turned bolts for axle-caps.—British Thomson-Houston Co., Ltd.

FORTHCOMING EVENTS.

Association of Engineers-in-Charge.—Wednesday, September 15th. At 7.30 p.m. At St. Bride's Institute, E.C. Annual meeting.

Institution of Mining Engineers.—Wednesday, September 15th. At 2.30 p.m. At Hotel Métropole, King Street, Leeds. Annual general meeting.

Institute of Metals.—Friday, September 17th. At 8.30 p.m. At the Chemical Society's rooms, Burlington House, W. Annual general meeting.

NOTES.

Fatalities.—The circumstances surrounding the death of George Fernie, an apprentice electrician, were inquired into by Sheriff Armour Hannay and a jury at Kirkcaldy. Deceased was found dead in the workshop at the power station at Kinglassie Colliery, belonging to the Fife Coal Co. Fernie, who was only 16 years of age, was found lying near where the cables are connected with the switchboard. Artificial respiration was attempted, without success. Deceased's father, a miner, stated that his son was employed at the power station at Kinglassie Colliery. On August 5th he went to work in his usual health. On hearing that his son had been killed witness went to the pit and found the men working the pulmotor in an attempt to bring the lad round, but it was in vain. He noticed only one mark on deceased's body—a thin burnt-like mark on the right thumb. John Gourlie, the colliery electrician, said Fernie was working under him. About 2.30 p.m. on August 5th he told Fernie to prepare for the extension of some lights. To do so he would have to go to the place where he had to extend the lights and repair any that were out. About 4.30 witness passed the turbine engine house, and on looking over to the workshop stair he saw Fernie lying on his back. His face was cold, but the pulmotor was tried. Witness was of opinion that the lad was dead when he first saw him. He had examined all the cables by feeling, and with an instrument, but found no defect. There was no leakage. Deceased was found practically under the medium power switchboard. He had no occasion to go there to carry out witness's instructions. Witness did not think the lad could possibly have been killed by electric shock.

Dr. Adam R. Wight Leslie said he examined the body on the morning after the accident, and along with another doctor had carried out a post-mortem examination. They found all the organs perfectly healthy. There was nothing in the body to show the cause of death, but everything he found was quite compatible with death from an electric shock. From what he found, and learned, he was of opinion that the boy died from electric shock. There was nothing found otherwise to account for death. There was a mark of injury on the left thumb, but no other mark on the body or clothing. In answer to the Sheriff, witness stated that in the case of a person being killed by shock it was not necessary there should be any marks.

Hugh Gordon Fraser, chief electrical engineer of the Fife Coal Co., said he had made a thorough examination of the plant and cables and found them intact. Besides being properly insulated the cables were all thoroughly earthed. It was quite impossible for the lad to have been killed by shock in the place. The jury were absent 15 minutes, and on returning the foreman intimated that they found that the boy, George Fernie, died at the place and time stated, but they could not find evidence as to the cause of death.

Reuter, quoting the Havre correspondent of the *Petit Journal*, states that M. Canonne, inspector of works, and engineer attached to the Ministry of Industry and Works in Belgium, was killed as he was entering Belgium from Holland. M. Canonne had been in France, and was on his way back to take up his official duties again. He accidentally came into contact with a live electric wire, and was killed on the spot.

An inquest was held at Newcastle-on-Tyne on Monday night upon the body of Alfred J. A. M. Henry (56), who was killed at Elswick Works on Saturday, while following his employment as an electrician. The evidence showed that while climbing up some trellis work to an overhead crane deceased caught hold of a "live" wire. He shouted to his mates to switch off the current. He then had one hand on the wire, the other on the crane, and one foot on a shaft. When the current was turned off he relaxed his grip and fell on to a machine, fracturing his skull. A verdict of "Accidental death" was returned.

An inquest was held at Wednesbury, on Friday of last week, relative to the death of William John Maybury (57), of Walsall, who died on the previous day as the result of coming in contact with live electric wires at the works of the Patent Shaft and Axletree Co., Ltd., Wednesbury. Deceased was a crane driver, and was helping to unload axles from a truck. The crane was stopped to allow a locomotive to pass, and a few minutes afterwards Maybury was found lying on the top of a cabin, near to which the crane was being worked. Evidence was given to the effect that a notice was posted in the cabin stating that when the crane was not in use the switch must be pulled out. Deceased, it is supposed, must have gone to do some oiling and, forgetting the switch had been left in, touched the live wires, as his left hand had been burned. The electrical engineer of the works said there was no reason why a screen should not be placed above the cabin as an extra precaution. The jury returned a verdict of "Accidental death."

Foreign Trade.—Figures for August.—The following are the electrical and machinery figures given in the official returns for August :—

	Month of August.		*Inc. or dec.*	*Eight months, 1915.*		*Inc. or dec.*
Imports.	£		£	£		£
Electrical goods and apparatus, excluding machinery and uninsulated wire	105,303	+	67,852	658,759	−	322,683
Machinery ...	793,903	+	485,604	6,067,803	+	982,228
Exports.						
Electrical goods and apparatus, excluding machinery and uninsulated wire	259,130	+	113,447	2,008,179	−	196,138
Machinery ...	1,483,934	−	224,139	12,999,904	−	11,482,612

Appointments Vacant. — Switchboard attendant (27s. 6d.) for Borough of Lancaster; engineer-in-charge, fitter driver, and pumping station attendant, for a military camp; chargeman for electric generating station; shift engineer (£2 2s.) for Swansea Harbour Trust; assistant mains superintendent (35s.) for Darlington electricity works. Particulars are given in our advertisement pages.

Educational.—In a circular to local education authorities and others, the Board of Education announces that the Regulations and Syllabuses which governed the Examinations in Science and Technology held in 1915 will continue in force for 1916; after 1916 it will no longer hold Lower General Examinations in any subjects of Science and Technology. The Higher General Examinations will for the present be continued.

Workmen's Compensation: Unusual Claim.—A novel claim under the Workmen's Compensation Act is reported to have been lodged with the Oldham Corporation. An employé of the Corporation died recently, and the grounds of the claim which has now been made in respect of his death are that death was caused by the shock received by the deceased through seeing a fellow workmate die while working alongside him in January last.

Volunteer Notes.—Engineering Institutions' Volunteer Training Corps.—

Company Orders.—By Lieut.-Col. C. B. Clay, V.D., Commandant, for week ending September 18th, 1915 :—

Monday.—Drills, 6.30-7.30 ; 7.30-8.30. Section 1, Technical instruction ; Section 3, musketry at range ; Sections 2 and 4, Squad drill or signalling.

Friday.—Section 2, Technical instruction ; Section 4, musketry at range ; Sections 1 and 3, Squad drill or signalling.

Classes for signalling instruction are being formed, and the names of those desiring to take part should be handed to the Section Commanders.

The Corps will still be glad to welcome recruits. Although primarily appealing to members of the Engineering Institutions, others whose tastes lie in the direction of a technical training will find this Corps meet their views.

Applications for membership should be made to the Commandant, Lieut.-Col. C. B. Clay, V.D., Marconi House, Strand, W.C.

3rd Batt. (Old Boys) Central London Regiment (Volunteers).—Battalion Orders by Colonel S. G. Grant (Officer Commanding), Thursday, September 9th, 1915 :—

Week-end Parades.—Saturday.—The Battalion will parade at Liverpool Street Station (low level entrance G.E.R.), at 1.50 p.m., and proceed by rail, for entrenching duties.

Sunday, 7 a.m., Réveillé ; 10 a.m., Church Parade ; 10.20 a.m., Battalion Parade (Bridging) ; 10.30 a.m., Sketching Class as usual ; 2·30 a.m., Battalion Parade (Bridging and Bombing).

Duties.—The special duty for which men were asked to volunteer, for Saturday next, the 11th inst., is cancelled.

Musketry.—There will be Firing at both Acton and Bisley Ranges on Saturday next, the 11th inst. Men who have sent in their names will parade at the usual times.

A. G. Joiner, *Major and Adjutant.*

The British Association.—Our special correspondent telegraphs that on Wednesday morning, in Section G, Prof. Hele-Shaw read his presidential address, after which Profs. Asakawa and Petavel read a paper on the thermal efficiency of a gas engine, and Prof. Thornton dealt with the total radiation from a gaseous explosion. In Section A (Mathematical), Prof. Soddy opened a discussion on radioactive elements and the periodic law. A crowded audience attended the discussion on industrial harmony, in Section F (Economics), which was opened by Prof. Kirkaldy ; other speakers were Sir Chas. Macara, Mr. Will Thorne, M.P., Sir Hugh Bell, and Mr. Evans. The discussion was resumed in the afternoon.

London — Birmingham — Liverpool Telephone Cable.—In consequence of the rapid growth of telephone traffic between London, Birmingham and Liverpool, the British Post Office is providing an underground telephone cable connecting the three cities. Stoneware multiway ducts, each way being of 3⅜-in. internal diameter, have been laid to form the conduits. The cable is made up of copper conductors, paper insulated ; the individual wires are twisted in pairs, and two pairs are then twisted together to form a four-wire core in the style known as "multiple twin," and there are 52 pairs of wires in the cable, distributed as follows :—

Central core	...	2	pairs,	each wire	300 lb. per mile.
First layer	...	14	"	" "	200 " " "
Second layer	{	12	"	" "	150 " " "
	{	24	"	" "	100 " " "

The whole is enclosed in a lead sheath of an average overall diameter of 2·9 in.

One telephone circuit is obtained on each pair, and one additional circuit per two pairs may be formed by "Superposed" or "Phantom" circuit working.

The cable and loading scheme were designed by the engineers of the Post Office, and the section London to Birmingham, 110¼ miles in length, has been manufactured, laid and jointed by the Western Electric Co., Ltd., North Woolwich. It has been carefully balanced during manufacture, and in the jointing processes, so as to make the electrical constants of the circuits such that the minimum of inductive disturbance takes place between one loop and another, whether "physical" or "phantom."

The section Birmingham to Liverpool, 90 miles in length, is being similarly treated by other contractors, namely, the British Insulated and Helsby Cables, Ltd., but is not quite ready for use.

Loading coils have been inserted in each circuit at 2½-mile intervals along the route, the iron cases containing the coils being accommodated in underground brick chambers. All the loading coils are of the Western Electric Co.'s type.

The estimated attenuation constants per mile and those actually obtained after completion of the London—Birmingham length are given below :—

Weight of single wire per mile forming loops.	* Attenuation constant per mile, 800 p.p.s. Estimated.	Observed.
300 lb.	·00480	·00408
200 "	·00684	·00664
150 "	·00875	·00884
100 "	·01161	·01074

(* The logarithmic decrement in the telephonic current strength per mile).

The results on the superposed (phantom) circuits are equally satisfactory and the attenuation constants of such circuits are somewhat less than those of the physical loops from which they are formed.

On Wednesday last, by the courtesy of Sir William Slingo, Engineer-in-Chief of the Post Office, and his staff, we were privileged to take part in a test of the speaking qualities of the new cable, and found that conversation between London and Birmingham direct over any loop in the cable was excellent ; no inductive disturbance from other loops in use could be detected.

Various lengths of loop were formed by doubling to and fro between London and Birmingham, thus :—

(*a*) London to Birmingham and back on two 300-lb. loops, equal to 221 route-miles, or, roughly, equivalent to a London-Liverpool length. The speech was very loud and distinct.

(*b*) The same route length as in (*a*), but using 200-lb. loops. The speech was still very clear.

(*c*) London to Birmingham and back on four 200-lb. loops, equal to 442 route-miles or, roughly, equivalent to a London-Glasgow length. The speech was still very good.

(*d*) The same loops as used in (*c*), but with the addition in series of two 300-lb. loops between London and Birmingham, making in all 663 route miles or, roughly, a London—Aberdeen length. Speech was not at all difficult, and was within what might be regarded as the commercial limit.

(*e*) The same loops as used in (*d*), but further extended by two 200-lb. loops between London and Birmingham, making in all 884 route miles. In this case speech was just possible, but could not be regarded as within the commercial limit.

Similar trials made on the phantom circuits give equally satisfactory results as regards speech transmission, and although during the trials there were 21 trunk circuits working in the cable, there was no observable interference from other physical or phantom circuits.

One novelty in the cable is the provision of the heavy (300-lb.) conductor loaded loops, the heaviest loaded conductors previously laid underground anywhere being slightly under 200 lb. per mile. The excellent results obtained reflect the greatest credit upon the engineering staff of the Post Office and the contractors.

Although equally good, or better, results may be obtained by using lines wholly overhead, it does not yet appear that equally good results can be obtained when the same route lengths are made up partly of overhead and partly of underground wires ; the line must be as far as possible homogeneous.

We believe that the results obtained constitute an absolutely new record in underground cable telephony, and demonstrate the technical possibility of conducting conversation by this means between any two points within the limits of the United Kingdom—although, of course, it is not suggested that it would be commercially practicable to provide for such communication. The close agreement between the calculated and observed characteristics of the line is particularly gratifying, indicating, as it does, that the engineers responsible for the design of the cable had completely mastered the difficult technical problems which surround the use of loaded underground cables for telephonic purposes.

Institution and Lecture Notes.—Institute of Marine Engineers.—The following are the further arrangements of this Institute for the coming session. All of the meetings are on Tuesdays, at 7 p.m. :—

October 5th.—"Engineering Prospects in Russia," by Mr. Jas. Anderson.
November 2nd.—"Development of Mechanical Ventilation, Hygienically, Aboveground, Underground and Underdeck," by Mr. James Keith.
December 7th.—"Stern Shaft Lubrication," by Mr. A. J. Lebeda.
January 11th, 1916.—"Power-driven Tools on Board Ship," by Mr. J. Hamilton Thomson.

Post Office War Bonus.—The war bonus conceded to Post Office workers will be paid from this week. The terms of the concession were :—3s. to men earning 40s. a week and under ; 2s. to men receiving more than 40s., but less than 62s. per week ; and women were awarded half of these amounts in each grade.

The Lighting of Factories and Workshops.—The first report of the Home Office Departmental Committee on lighting in factories and workshops has just been issued, the Committee feeling that although the investigation is incomplete, and cannot be completed under the conditions prevailing at present, it is desirable to make available to the public the work already done, and to formulate certain recommendations regarding suitable standards of illumination. The report contains an immense amount of detailed information, and the subject is discussed at considerable length. The conclusions of the Committee in brief are that statutory standards of "adequate and suitable illumination" should be set up, and the standards suggested are a minimum illumination on a horizontal plane at the floor level of 0·25 foot-candle in workrooms, 0·4 foot-candle in foundries, 0·1 foot-candle in passages, and 0·05 foot-candle in open spaces out of doors. These recommendations are subject to certain qualifications and exemptions, and are, of course, only provisional ; they will serve, however, to indicate approximately the standards that will eventually be adopted, and will thus be of assistance to works managers, who will also find the mass of data contained in the voluminous appendices of the greatest value. In later issues we shall review this very important document at greater length than is possible at the moment.

Radium Spring Discoveries.—The *Financier* reports that the strongest radium mineral spring in the world has been discovered at Oberschlema, Saxony, and that bath-houses are to be erected there for treatment of the wounded. Simultaneously with this report, news arrives that the company owning the radium baths at Joachimsthal, in Bohemia, is bankrupt.

It is reported that in Colorado mineral springs have been discovered containing radium in such large quantities that a gramme of the metal will in future cost only £7,200 instead of £32,000.

Machinery Maintenance in China. — The Acting British Consul at Wuhu reporting on the foreign machinery used in that city, remarks that the Chinese seem to expect that their machinery will run at full load during an indefinite number of years without other care than occasional oiling, and that the economy of a maintenance and refit charge does not apparently appeal to the Chinese mind. The policy of getting quick and large returns without making allowances for the inevitably following exhaustion is unfair to manufacturers, for machinery is unjustly blamed when the fault really resides in the Chinese lack of business method. He, therefore, suggests that it would pay U.K. manufacturers to allow long credits with a proviso that the supplier of the machinery should have the right to send a competent engineer to inspect it every two or three years. The purchaser would have to pay for the services of the expert, but that could be arranged for in the contract price. In this way British machinery would have a better chance of showing its worth.—*Board of Trade Journal.*

Copper.—European visible supplies, as shown by Messrs. H. R. Merton & Co.'s statistical circular, were 999 tons less at the end of August than at the end of July last. English supplies, however, were only 31 tons less, and French 20 tons higher. In detailed supplies, European arrivals from North America were low at 16,070 tons, while Spain and Portugal supplied England and France with a quantity of 126 tons less than the pre-war average. "Other countries" sent England and France a quantity 10 per cent. higher than in pre-war times. Chile shipments were rather below pre-war average, Australian above. Total supplies, though higher than last month, are considerably below last March, April or May (months when the "blockade" might be expected to be vigorous) while deliveries, higher than the last two months, reflect the general activity.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials. — MR. C. E. CROCKER, manager and attorney for the Kalgoorlie, West Australia, Power and Lighting Corporation, has been appointed manager of the Perth (West Australia) City Council's electricity, lighting and gas departments.—*Tenders.*

General.—The following announcement appeared in the *London Gazette* on September 3rd :—

War Office.—Regular Forces: General Staff. General Staff Officer—2nd Grade—Major Walter A. J. O'Meara, C.M.G., Reserve of Officers. Dated August 19th, 1915.

Private JAS. CHANDLER, of the 2nd Sportsman's Battalion, who was on the staff of Siemens Dynamo Works, Ltd., at Stafford, has been gazetted Lieutenant in the battalion.

On September 1st the marriage took place at St. Barnabas Church, York, of Sapper F. E. POWELL, of the Royal Engineers, who was on the electrical staff of the North-Eastern Railway Co., and Miss Annie Croft, of York. The bridegroom is leaving for the Front.

We are informed that MR. W. J. POLYBLANK is not now connected with the Magneta Time Co., Ltd.

The marriage took place, at the Parish Church, Gillingham (Kent), on August 28th, of MR. HENRY KNIGHT, eldest son of Mr. C. Knight, to Miss Hilda Emma Marriott, daughter of Mr. Chas. Wm. Marriott, of the electrical staff of H.M. Dockyard, Chatham.

The employés of Messrs. J. H. Tucker & Co., of Hay Mills, Birmingham, gathered together on Friday, the 3rd inst., to bid "Good-bye" and "Good luck" to MR. J. B. TUCKER, the son of the founder and present head of the firm, who has been granted a commission in the Royal Engineers, and who was leaving the next day to join his regiment. The meeting was held in the works during the tea interval, and was of a most cordial character—a tribute to the personal popularity of Mr. J. B. Tucker, and to the happy relations existing between the firm and the employés generally. From those representatives of the firm who were unavoidably prevented from being present, Mr. Tucker received during the meeting telegrams of congratulations and good wishes. Mr. R. H. Lamb, who has been with the firm some 15 years, presided, and said that they could not let Mr. J. B. Tucker go without some mark of their appreciation and esteem. A Committee had been hastily formed, and it was decided that, in addition to "Good wishes," Mr. Tucker should carry with him something that would be a constant reminder of those whom he was leaving. Mr. Bisby, who has been with the firm 20 years, on behalf of the employés in the works, then presented Mr. Tucker with a Webley and Scott service revolver. Miss Jeffries, who has been in the service of the firm some 14 years, on behalf of the office staff, presented a silver cigarette case, suitably inscribed, and Mr. Willmott, the oldest official of the company, having been with them upwards of 19 years, on behalf of the officials, asked Mr. Tucker's acceptance of a sword, sword knot and scabbard, suitably engraved as a record of the occasion. In acknowledging the gifts and the very warm welcome which greeted him as he rose, Mr. Tucker said that he always seemed to be receiving similar marks of their goodwill. He could only express his appreciation of their kindness and good wishes, and thank them very much. In response to calls for a speech from the head of the firm, Mr. J. H. Tucker, after referring to the fact that "It was really not his show that afternoon at all," joined with the meeting in wishing his son every success and a speedy and safe return. He referred in terms of appreciation to the men who had already gone from the works and were now serving their country, also to those in the works, who, though not in the same way, were equally serving their country and doing their duty. Whilst they honoured his son that afternoon none of the others were forgotten. Hearty cheers for the firm, for Mr. J. B. Tucker, and the singing of "For he's a jolly good fellow," brought the proceedings to a close.

MR. WILLIAM H. TAYLOR, A.M.I.E.E., electrical superintendent of tramways at Perth, has been appointed arbitrator to grant an award for the use of electricity in the Collie Coalmines.

The following members of the staff of the Cape Town city electrical department have enlisted in the South African Overseas contingent:—Messrs. Wallace and Smith, draughtsmen; Messrs. Nixon and Roper, installation inspectors; Messrs. Purcell and Mostert, meter readers; Messrs. Driver, Van Niekerk, and Strusk, mains department; Mr. Knox, clerk; Mr. Desmond, battery attendant; and Mr. Smith, fireman. This is a very good percentage out of a total of 32 white members of the staff.

Roll of Honour.—Private JOHN RADCLIFFE, of the Royal Munster Regiment, who was on the Rochdale Corporation electricity staff, has been wounded in the foot at the Dardanelles, and is in hospital at Liverpool. He enlisted a year ago, and proceeded to the Dardanelles in July.

Corporal WM. HENRY HEDGCOCK, who was on the staff of the Isle of Thanet Tramway and E.L. Co., Ltd., has died of wounds received in action in the Dardanelles. Deceased, who lived at Ramsgate, was an old Army man, and was 48 years of age. He rejoined the Forces early in September, 1914, and attached to the Military Mounted Police was drafted to the Mediterranean in June. He died on August 20th.

Corporal J. LOMAS, a Territorial employed at the Blackburn electricity works, has lost his life in the Dardanelles. He was going to the assistance of a comrade when shot down by a sniper.

MR. JOHN SCURR LEESE, of the 6th Manchesters, formerly employed by the British Westinghouse Co., is reported missing at the Dardanelles.

Private J. J. O'CONNOR, of Ashton, formerly an electrician employed at the Delta Works, Guide Bridge, has been killed in action. He was 19 years of age, and was serving at the Dardanelles with the 1/9th Battalion Manchester Regiment.

Private R. B. BROWN, of the 10th Rifle Brigade, an employé in the offices of the Peel-Conner Telephone Works, Salford, was killed by a sniper in France last week.

Private ROBERT OWEN, of the 11th King's (Liverpool) Regiment, formerly employed at the Chloride Electrical Works, Clifton, near Manchester, has died from wounds received in the fighting in France. He was 20 years old.

Corporal JOHN BARNES, of the 11th Auckland (N.Z.) Mounted Rifles, formerly employed in the Middleton Corporation tramway department, has been killed in the fighting on the Gallipoli Peninsula. He was 34 years of age.

Private ALBERT MICHAEL MILLS, of the 5th Queen's Surrey Regiment, who was on the staff of the Guildford Electricity Supply Co., has died from fever in the Military Hospital, at Fyzabad, India.

Lieut. L. L. REES MOGG, of the Royal Engineers, who was with Messrs. Willans & Robinson, Ltd., Rugby, has been killed in action.

Obituary.—MR. F. H. W. HIGGINS.—On Saturday last there were laid to rest at Abney Park Cemetery the remains of Mr. Frederick Herbert William Higgins, M.I.E.E., chief engineer to the Exchange Telegraph Co., Ltd., who passed away at his residence at Stamford Hill, on September 1st, at the age of 66 years. Mr. Higgins commenced his career in the Post Office Telegraph Department, and after passing through the junior ranks was made Superintendent of Telegraphs in the island of Mauritius. After being there some years he returned home and entered the service of the Exchange Telegraph Co. in the year 1873, devoting his inventive genius henceforth to the development of type-printing telegraphs in the various forms now familiar to the public as "Tape" instruments. In this he was particularly successful, as besides perfecting various forms of "relays" he very largely increased the speed of the instruments. The original form of tape machine which was brought over from America was known by the name of its inventor, Mr. T. A. Edison, and when first worked in this country printed at the rate of six words per minute only, but thanks to Mr. Higgins's skill various important alterations and improvements were from time to time effected, resulting in the present form of apparatus, which prints, in tape form, at a speed of from 35 to 45 words per minute, according to the individual skill of the operator, and, in addition, he invented an instrument printing on a broad band of paper, known as a column printer, now largely in use in the principal clubs and hotels in London and the chief Provincial towns. Mr. Higgins was also the patentee of numerous inventions in electric fire alarms, and the author of many papers read before the Institution of Electrical Engineers, of which he was a Member. He leaves a widow and family. Several of his sons are now serving the country.

We are indebted to a correspondent for the following references to Mr. Higgins's life and work :—"The late Mr. F. H. W. Higgins entered the service of the Electric and International Telegraph Co.

in the 'sixties'; before he was 20 years old he had devised a non-inductive shunt for increasing the speed on repeater circuits. He was then transferred to the late Mr. R. S. Culley's laboratory, where he commenced an investigation into the establishment of current in a submarine cable. The application of the results of this investigation effected an increase of speed in the Dutch cables of such a magnitude, that a contemplated new cable was afterwards considered as unnecessary. Soon after this Mr. Higgins became superintendent of telegraphs to Mauritius, where he applied himself with great energy to the manifold duties which then devolved upon the telegraph engineer—including the blasting of a channel into the principal harbour of the Seychelles Islands, and the construction of a massive time ball at Mauritius. After three years in the island, Mr. Higgins returned to England, and in 1872 applied himself to the study of the distributive printing telegraph, which he made the work of his lifetime, and which he developed to a great degree of efficiency. The Exchange Telegraph Co. were then using the Edison printer; Mr. Higgins developed this instrument and greatly increased its speed, and later devised a new system of transmission, which enabled him to still further improve the apparatus. The necessity for an apparatus which printed on a broad band, instead of the familiar tape, caused Mr. Higgins to devise his column printer, an instrument now familiar in every large club and hotel. Mr. Higgins was responsible for many other inventions, among which may be mentioned his annunciator, which announces to the Members of the House of Commons the various happenings in the Chamber; also his fire-alarm system."

The death is notified of Mr. Geo. T. Evans, of Langland, Margam, electrician to the Margam Estate.

Mr. J. W. Nicholson, for 20 years engaged in the Leeds tramway department, and who was for the past six years hon. secretary of the Leeds Municipal Officers' Guild, died last week, at the early age of 48 years.

Will.—The late Prof. W. Grylls Adams, F.R.S., left £13,200 gross, and £5,000 net personalty.

NEW COMPANIES REGISTERED.

Smith, Lemon and Stewart, Ltd. (141,411).—This company was registered on August 27th, with a capital of £2,000 in £1 shares, to carry on the business of consulting engineers, manufacturers and commission agents as formerly carried on by T. E. Smith, C. W. Lemon, and T. W. Stewart, as "Smith, Lemon & Stewart," and to carry on the same and the business of manufacturers of and dealers in tarpaulins and other waterproof materials and coverings, metals, and all classes of machinery and tools, and things operated by electricity, steam, internal combustion, water or compressed air, ships' fittings, outfits, paints, varnishes, greases, oils, colliery and ships' stores, boiler insulating materials, telegraph, telephone and other electrical equipment, etc., used in engineering or shipbuilding yards and collieries. The subscribers (with one share each) are: T. E. Smith, County Chambers, Newcastle-on-Tyne, consulting engineer; C. W. Lemon, County Chambers, Newcastle-on-Tyne, consulting engineer; T. W. Stewart, County Chambers, Newcastle-on-Tyne, consulting engineer. Private company. The number of directors is not to be less than two or more than five; the first are T. E. Smith, C. W. Lemon, and T. W. Stewart (all permanent, subject to holding 250 ordinary shares). Qualification of other directors, 100 ordinary shares. Solicitor: E. L. Bates, 20, Collingwood Street, Newcastle-on-Tyne. Registered by Jordan & Sons, Ltd., 116-17, Chancery Lane, W.C.

Westwood Electrical Co., Ltd. (141,383).—This company was registered on August 25th, with a capital of £4,000 in £1 shares, to carry on the business of manufacturers of and dealers in electrical and general fittings and accessory parts thereof, electrical and general engineers, etc. The subscribers (with one share each) are: F. Westwood, 37, Lawdon Road, Birmingham, director; E. M. Westwood, 14, Park Road, Sparkhill, Birmingham, director. Private company. The number of directors is not to be less than two or more than five; the first are F. Westwood and E. M. Westwood. Qualification, 500 shares. Solicitor: T. J. Richards, 126, Colmore Row, Birmingham. Registered Office: Lawdon Road, Bordesley, Birmingham.

Seear, Scott and Co., Ltd. (141,463).—This company was registered on September 1st, with a capital of £3,000 in £1 shares (2,250 7 per cent. pref. and 750 ord.), to take over the business of manufacturing electrical and general engineers now or lately carried on by Seear, Scott and Co., Ltd. (old company), to carry on the business of mechanical, electrical, telegraphic and general engineers, manufacturers and builders, model and tool makers, founders, metal workers, cart, coach, carriage and van builders, manufacturers of and dealers in machinery, vehicles, boats, submersible and flying machines, and mechanical implements, etc., and to adopt an agreement with J. Scott. The subscribers (with one share each) are: J. Scott, 17, Lismore Road, Croydon, engineer; E. C. Seear, 16-17, Devonshire Square, E.C., electrical engineer; R. H. Yuile, 24, Moreton Road, Croydon, draughtsman. Private company. The number of directors is not to be less than two or more than five; the first are J. Scott (chairman), E. C. Seear, and R. H. Yuile. Qualification £50. Remuneration as fixed by the company. Secretary: E. C. Seear. Registered office: 51a, St. Peter's Street, South Croydon.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Electro-Flex Steel Co., Ltd.—Issue, on August 20th, 1915, of £5,100 debentures, part of a series of which particulars have already been filed.

Pritchett and Gold and Electrical Power Storage Co., Ltd.—Particulars of £30,000 debentures, created August 12th, 1915, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £10,000. Property charged: The company's property, present and future, including uncalled capital, and premises at Dagenham, Essex, with fixed machinery, etc. No trustees.

Carville Site and Power Co., Ltd.—Issue, on August 28th, 1915, of £10,000 debentures, part of a series of which particulars have already been filed.

Defries and Goldman, Ltd.—Particulars of £600 "B" debentures, created August 21st, 1915, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £300. Property charged: The company's property, present and future, including uncalled capital. No trustees.

Evered and Co., Ltd. (20,158).—Capital, £200,000 in £1 shares. Return dated May 12th, 1915. All shares taken up. £1 per share called up on 35,040 and 14s. per share on 63,800; £79,700 paid; £91,044 considered as paid, being £1 per share on 67,440 and 14s. per share on 33,720 shares. Mortgages and charges: £20,600.

Electric and General Investment Co., Ltd. (31,506).—Capital, £201,500 in 20,000 ord. and 19,900 pref. shares of £5 each and 40,000 defd. shares of £1 each. Return dated August 10th, 1915. All shares taken up. £1 per share called up on the ord., 1s. per share on the defd., and £5 per share on the pref.; £121,500 paid. Mortgages and charges: £37,813 10s.

Electricity Supply Co. for Spain, Ltd. (29,103).—Capital, £105,000 in 20,000 pref. shares of £5 each and 19,900 ord. and 100 founders' shares of 5s. each. Return dated December 31st, 1914 (filed April 8th, 1915). 17,330 pref., 19,900 ord., and 100 founders' shares taken up. 5s. per share called up on 19,900 ord.; £4,975 paid; £86,675 considered as paid, being 5s per share on 100 founders' and £5 per share on 17,330 pref. Mortgages and charges: £133,800.

Electromotors, Ltd. (60,826).—Capital, £50,000 in £1 shares. Return dated May 31st, 1915. 42,370 shares taken up; £42,370 paid. Mortgages and charges: Nil.

Europe and Azores Telegraph Co., Ltd. (39,452).—Capital, £200,000 in £10 shares. Return dated July 7th, 1915. All shares taken up. £144,320 paid; £55,680 considered as paid. Mortgages and charges: Nil.

Consolidated Electrical Co., Ltd., (77,054).—Capital, £125,000 in £1 shares (15,000 six per cent. pref.). Return dated July 20th, 1915. All shares taken up. £1 per share called up on 15,000 pref. and 757 ord., and 5s. per share on 109,243 ord; £43,067 15s. paid; £81,932 5s. considered as paid, being 15s. per share on 109,243 ord. Mortgages and charges: Nil.

Chiswick Electricity Supply Corporation, Ltd. (38,854).—Capital, £100,000 in £1 shares. Return dated June 2nd, 1915. 62,800 shares taken up. £62,800 paid. Mortgages and charges: £80,000.

CITY NOTES.

German Electrical Companies.

The A.G. Kortings Elektrizitats Werke, of Berlin, has declared a dividend of 4 per cent. for 1914-15, as compared with 6 per cent. in the previous year.

The Ges. fur Elektrotechnische Unternehmungen, of Munich, reports that the increased receipts from supply, installations, and contracts in the first half of 1914-15 were more than extinguished in the second half of the year. It is proposed to pay 4 per cent. on the preference capital, as in 1913-14, but no distribution is again made on the ordinary shares.

The Internationale Stickstoff A.G., of Wiesbaden, records a further loss in 1914, whereby the debit balance has risen to £46,000 on a share capital of £103,000. The report states that improvements have been made at the Patsch nitrogen works, and the factory at Innsbruck is in a state of progressive development, whilst the large State works near Halle, which is to operate on the Pauling process, will presumably be brought into use in the near future.

The A.E.G. Unternehmungen A.G., of Frankfort-on-Main, which was formed in 1911 by the A.E.G. and the Carlswerk (Felten & Guilleaume) as an investment and site company, reports profits from dividends, interest and rent amounting to £35,500 in 1914-15, as contrasted with £36,600 in the preceding year, and net profits of £32,000 and £31,900 in the two years respectively. A dividend at the rate of 6 per cent. has been declared, being the same as in 1913-14. The company holds £200,000 in shares in the Carlswerk and shares in the Meissner Tramway, whilst the Frankfort works, formerly owned by the Carlswerk, are leased to the A.E.G.

The report of the *Wolfram Lampen A.G., of Augsburg,* for 1914-15 states that the turnover experienced a considerable reduction through the war, and as no compensation could be obtained by the manufacture of war material, working had first to be restricted and then totally suspended for a short time. The inland sales departments were at first at a standstill, although a general improvement took place subsequently, but no connection was being maintained with the sales organisations in hostile countries. As gross profits, the accounts show the sum of £75,000, as against £116,000 in 1913-14, general expenses and depreciation bringing the net profits down to £824, as compared with £2,000 in the previous year. A dividend of 6 per cent. was paid on the preference capital for 1913-14, but for the past year no distribution is being made on both preference and ordinary shares. It is, further, mentioned that the patent action in regard to drawn wolfram wire is pending in the final court.

The Compagnie Electro-Mécanique, of Le Bourget, near Paris, in which the Swiss firm of Brown-Boveri is inter-

ested, reports that the satisfactory demand for steam turbines and electrical plant which was experienced in the first seven months of 1914 ceased after the outbreak of the war, so that the working results were affected unfavourably. Early in 1914 the share capital was increased from £200,000 to £400,000, but the augmentation, under the circumstances prevailing, was unable to be utilised to the desired extent in promoting the receipts. The gross profits are returned at £69,000, as compared with £99,000 in 1913, and the net profits at £25,000 and £61,000 in the two years respectively. These are, however, not strictly net profits, as they make no provision for depreciation. The amount set aside for depreciation practically absorbs the net profits, and compares with £41,000 in 1913, so that no dividend is payable, whereas a rate of 8 per cent. was paid in each of the previous three years.

The Compagnie Métropolitain, of Paris, reports that the occurrence of war exercised decisive effects on the development of the railway, as the working of various lines had to be suspended immediately after the French mobilisation, and the receipts consequently declined. Whilst the receipts on August 2nd amounted to £6,204, or an increase of 43 per cent. as contrasted with the same day of 1913, eight days later they had fallen to £1,918, and reached the lowest level on August 15th at £1,545, this amount showing a decrease of 58 per cent. as compared with the equivalent day in the preceding year. With the resumption of working, however, a gradual advance in the receipts took place, and from a total of £75,000 in the month of September the receipts rose to £140,000 in December, but this amount was less by £67,000 than in the same month in 1913. The total revenue from the sale of tickets reached £1,855,000 in 1914, as against £2,179,000 in 1913, whilst the working expenses were £847,000 and £966,000 in the two years respectively. After deducting the shares of the City of Paris in the gross receipts, the net profits are recorded at £445,000, as contrasted with £553,000 in the previous year. It is intended to pay a dividend of 11s. 2½d. per £10 share, this comparing with 17s. 2½d. in 1913. The directors state that from the working results in the new financial year the crisis may be considered as almost entirely overcome. The company derives advantage at present from the absence of motor omnibuses, but the hope is expressed that traffic later on will increase so largely as to extinguish the losses hitherto incurred.

The Compagnie Francaise Thomson-Houston, which was in close relations with the A.E.G. prior to the war, reports that although deprived of 60 per cent. of the *personnel* through the mobilisation, it was possible for the company to maintain working, notwithstanding the moratorium, the deficiency in traffic conditions, and the difficulties experienced in obtaining raw materials. Only one shop was excluded, namely, that at Lesquin, which lies in the area occupied by the enemy. Immediately on the outbreak of hostilities the company placed its industrial organisation at the disposal of the Army and Navy, and, at the same time, it was still able to meet the requirements of current business. The company neither availed itself of the facilities afforded by the moratorium in relation to the creditors nor in regard to the shareholders. The net profits at £127,000 were less by £53,000 than in 1913, and the dividend is 5 per cent. on share capital of £2,400,000, as contrasted with 7 per cent. in the previous year, the amount carried forward being £7,000. As to the relations formerly existing with the A.E.G., the directors state that the agreements were concluded to avert the invasion of German production, which had made itself perceptible in all branches of industrial, commercial and financial activity. In regard to the future, the French company's programme lay completely in the determination that all relations between the French and Germans were impossible. The dissolution of these relations would result in difficult problems; they would be all the easier the more complete the victory of France became, and they could, therefore, look forward to them without anxiety. It is added that as a consequence of existing conditions, the dissolution and liquidation were already being observed of the Société Francaise of the A.E.G., which was brought into existence by the French Thomson-Houston Co.

Aberdeen Suburban Tramways Co., Ltd.

At the half-yearly meeting, Mr. JAMES MEARNS, the Chairman, said that notwithstanding the shrinkage in revenue, which was entirely due to temporary causes, the directors had come to the conclusion that the time had arrived for an increased dividend. For many years back the directors' policy had been to restrict the dividend in order that they might build up a strong renewal and depreciation fund. This fund, with the amount which the directors proposed to add this half-year, now amounted to half the capital of the company, and, in view of the condition of the undertaking generally, the directors were satisfied that they would not require to write off in future years so much as had been written off in the past, and they hoped to be able to maintain, if not to increase, the dividend that they now proposed to pay (5 per cent.). In regard to the negotiations for the purchase of the company's undertaking, which were initiated by the Town Council, no substantial progress had been made. In place of the late Mr. Jackson, the directors appointed Mr. James Sellar, who, for a time, managed the Singapore Tramways, as one of the directors. After references to the satisfactory financial position, the report was adopted.

United Electric Car Co., Ltd., Preston. — The directors' report for the year ended June 30th, 1915, states that the works have been efficiently maintained as regards buildings and machinery, the cost of which has been charged against revenue. After charging £5,332 for depreciation (including £4,500 added to reserve), the profit for the year is £8,553, plus £2,154 brought forward, making £10,707, less the preference dividend for the six months ending December 31st, 1914, £3,000, leaving an available balance of £7,707. The directors recommend the payment of the preference dividend, less income-tax, for the half-year ending June 30th, 1915, £3,000, carrying forward £4,707.

Dumbarton Tramways Co., Ltd.—The accounts for the year ended July 31st show that the profit for the year, including the balance brought forward, after providing for interest on debenture stock, amounted to £10,790. A dividend of 1½ per cent. on the ordinary shares is proposed.

Clyde Valley Electrical Power Co.—The profit for the past half-year, including £11,535 brought forward, amounts to £54,095. After adjusting interest and transferring £18,709 to contingency fund for depreciation, &c., the directors recommend that £4,276 be transferred to reserve fund, £10,000 applied in writing down cost of legal charges, the dividend paid on the preference shares to October 31st, 1915, and £12,430 carried forward.

British Electric Transformer Co., Ltd.—An interim dividend at the rate of 6 per cent. per annum, less income-tax, on the ordinary shares is announced for the past year.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—Interim dividend for the quarter to June 30th of 2s. 6d. per share, free of tax.

Calcutta Electric Supply Corporation, Ltd.—The number of units sold to consumers, during the five weeks ended July 30th, 1915, amounted to 2,474,568, compared with 1,851,329 units in the corresponding five weeks of 1914.

Liverpool District Lighting Co., Ltd.—Interim dividend 4 per cent. per annum, less tax, for the half-year to June 30th.

STOCKS AND SHARES.

TUESDAY EVENING.

There is a general firmness about the markets of the Stock Exchange as a whole which is satisfactory enough to those who watch this barometer of the national pulse. Prices are well held in most departments. The Home Railway stocks, which for a long time have been stagnant and depressed, are in somewhat better fettle. The illumination list is very quiet, both electric lighting shares and gas stocks hardly moving. Telegraphs are disposed to improve again.

What the Stock Exchange wants more than anything else, to influence its securities, is definite news. The daily *communiqués* from the various fronts contain nothing of sufficient importance to affect markets one way or the other. The Russian retreat is not regarded as being serious enough to justify any financial alarm; it certainly has brought very little stock to market, and this week the tendency has been to put prices up to what they stood at before the fall of Warsaw, and subsequent developments on this line. The news for which everyone is waiting with intense eagerness is that concerning the passage of the Dardanelles.

The gyrations in the American rate of exchange have helped Stock Exchange business to some extent, in that they had the effect of forcing up the prices of various American securities until these prices attained levels quite out of proportion to those of British issues. This we have pointed out once or twice previously, and the result has been to bring in sellers of American railroad and industrial bonds, with the natural consequence that the inflated prices gave way. American Marconis, for instance, from 22s. slid back to 15s. 6d. New York Telephone bonds there was a rush to sell at par, and the price has reacted to 97¾. The same conditions prevailed in other American issues, it being felt that the drop in the sterling exchange could be only a temporary affair in the nature of things, and that its rectification would be followed by the restoring of prices to more normal standards.

Meanwhile, the German Chancellor talks with amusing bombast of the new loan which he is issuing in Berlin. How serious the financial situation in Germany must be getting may be read between some of the lines of his speech, in which, as security for the loan, he held out the compensation that Germany would claim, if—he had the grace to say "if"—victory was granted to them. "Those who provoked war, and not we, deserve to drag through the centuries to come the leaden weight of those milliards. No doubt," he explained, "the fearful financial exhaustion of our opponents will make this somewhat difficult of attainment; but we shall

do all that is possible to obtain it." He alluded, significantly enough, to the hint thrown out by the German Government to the bourses that there is a better field than speculation in securities for the employment of liquid assets. "All available gold," he declared, "belongs to the country to-day."

At the end of last week, there was a little news in from Mexico which read more encouragingly. Prices in the railway markets made a start towards improvement, but this was not maintained. The information was of a character too nebulous for people to take much notice of it without further confirmation, and this is still awaited. Therefore, the Mexican group remains weak.

Brazilian Tractions have gone back ½ to 47, the market being somewhat under the influence of sales by those who bought perhaps more than they ought to have done two or three months ago. The Rio rate of exchange, moreover, offers no attraction to speculatively-invest—it is a moot point whether a hyphen word splits an infinitive or not—in Brazilian things of any sort, and so the market is disposed to rest. Rio Tramway 1st mortgage bonds, with a coupon due on the 1st of next month, have been picked up at 71. Anglo-Argentine Tramways debenture issues advanced in sympathy with the stocks of the Argentine railway market.

There is nothing doing in British Columbia descriptions, the only bargain recorded this month up to the present being one at 28½ in the preferred ordinary stock. Odd lots of British Electric Tractions have been done within the past week at 70 in the 6 per cent. preference, 41 in the non-cumulative preference, and 11⅞ in the preferred ordinary. A small amount of London United Tramways 1st debenture stock was sold a few days ago at 42½.

Home Rails, as already mentioned, are inclined to be a little better, and the tendency has begun to penetrate the electric railway issues. Underground Electric income bonds, at 70¾ ex dividend, are somewhat better: the shares are steady at their previous levels. Central London ordinary is a dullish spot at 71. The non-assented last changed hands, in May, at 40, but no transactions have taken place this year in the preferred or deferred stock of the non-assented varieties. There is a little doing in Metropolitan Surplus Lands on the basis of 48, and the Ordinary is ¼ up. East London consolidated stock is being dealt in at 2⅝, which, by the way, is about half the price at which the stock stood when war broke out.

The Telegraph market is the firmest of them all. Eastern Extensions, Eastern ordinary, Globe ordinary and Western Telegraphs have all improved, and the recent blocks of deceased-account stock appears to have been absorbed. The tone is accordingly much harder, and sellers are able to get better terms. Marconi shares are 1/16 down, as are Americans, which dropped sharply to 15s. 6d. in consequence of a rise in the New York exchange. This latter factor had the effect of reducing New York Telephone bonds from 100 to 97¾; even this lower price looks more than sufficiently high, when compared with quotations for many domestic stocks.

British Insulated were taken the other day at 10 11/16, but the handful of shares by no means exhausted the various sellers that there are in the market. The Manufacturing group on the whole is steady, but Henleys 4½ per cent. preference at 4¼ have moved back to the 5 per cent. level, at which it is not unreasonable to suppose the shares ought to stand in days when British Government stock returns 4¾ per cent. Except for this, there are no changes worth mentioning. The rubber market remains very firm. Notwithstanding the realisations of a few "dead" accounts, prices keep up well, although there is no startling movement from day to day. In the armament group, Vickers are moving quietly upwards; while as regards copper shares, the recent improvement has been stayed in consequence of a check to the rise in the price of the raw product.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month.		No. of weeks.	Total to date.		Route miles open.	
		£	£		£	£		Inc.
Blackpool-Fleetw'd	Aug. 28	8,510	+1,888	34	26,351	— 2,639	8	..
Bristol	„ 27	44,837	+6,443	34	325,739	+27,595	80·5	..
Chatham and Dist.	..	..	..	..	..	..	..	..
Cork	„ 26	2,905	+ 61	34	17,035	— 241	54·25	..
Dublin	„ 27	26,314	+ 986	34	208,466	+ 6,262	9·89	..
Hastings	„ 26	6,622	+1,013	..	..	— 942	19·8	..
Lancashire United	„ 25	7,806	+ 884	42	58,810	+ 2,343	42	..
Llandudno-Col. Bay	„ 27	2,871	+ 392	39	12,929	+ 740	6·5	..
Tyneside	„ 25	2,898	+ 163	8	5,459	+ 390	11	..
Anglo-Argentine ..	„ 26	202,078	+1,425	34	1,783,692	—135,814	..	..
Auckland	July 30	20,408	— 374	30	22,153	— 1,158	25·42	1·06
Calcutta	Aug. 28	17,860	— 134	..	..	— 6,618	..	..
Kalgoorlie, W.A. ..	May	3,269	..	21	13,472	..	..	..
Madras	Aug. 31	4,233	+ 385	34	32,594	+ 218	..	..
Montevideo ..	Aug.	26,493	+ 418	44	278,846	—31,892	..	..
Dublin-Lucan Rly.	Aug. 27	714	+ 5	8	1,990	— 81	7	..

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend, 1914.	Price Sept. 7, 1915.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.				
Brompton Ordinary	10	7⅛	—	£6 13 4
do. 7 per cent. Pref.	7	7½	—	4 16 7
Charing Cross Ordinary	5	3⅝	—	6 13 4
do. do. do. 4½ Pref.	4½	3⅜	—	6 0 0
do. do. City Pref.	4½	3⅜	—	6 0 0
do. 4 Deb.	4	80	—	5 0 0
Chelsea	5	4⅜	—	5 14 8
do. 4½ Deb.	4½	88	—	4 17 10
City of London	9	12½	—	7 7 0
do. do. 6 per cent. Pref.	6	10½	—	5 11 4
do. do. 5 Deb.	5	100	—	5 0 0
do. do. 4½ Deb.	4½	85	—	5 6 0
County of London	7	10½	—	6 13 4
do. do. 6 per cent. Pref.	6	10½	—	5 14 3
do. do. 1st Deb.	4½	90	—	5 0 0
do. do. 2nd Deb.	4½	85	—	5 6 0
Kensington Ordinary	9	6½	—	7 4 0
London Electric	4	13	—	8 8 4
do. do. 6 per cent. Pref.	6	4⅜	—	6 6 4
do. do. 4 Deb.	4	80	—	5 0 0
Metropolitan	3½	2½	—	7 0 0
do. 4½ per cent. Pref.	4½	3⅜	—	6 0 0
do. 4½ Deb.	4½	90	—	5 0 0
do. 3½ Deb.	3½	70	—	5 0 0
St. James' and Pall Mall	10	6⅜	—	7 8 2
do. do. do. 7 per cent. Pref.	7	6¼	—	5 12 0
do. do. do. 3½ Deb.	3½	70	—	5 0 0
South London	5	2⅞	—	6 19 0
South Metropolitan Pref.	7	1 1/16	—	6 14 0
Westminster Ordinary	9	6⅜	—	6 18 4
do. 4½ Pref.	4½	4½	—	5 9 0
Telegraphs and Telephones.				
Anglo-Am. Tel. Pref.	6	98	—	6 2 6
do. Def.	1½	21½	—	7 1 2
Chile Telephone	8	6⅜	—	5 18 5
Cuba Sub. Ord.	5	8½	—	6 1 8
do. Pref.	10	15	—	6 13 4
Eastern Extension	7	11⅜	+ ¼	*6 17 0
do. 4 Deb.	4	79	—	5 2 1
Eastern Tel. Ord.	7	116	—	*6 16 0
do. 8% Pref.	8½	70	—	5 0 0
do. 4 Deb.	4	81	—	4 19 0
Globe Tel. and T. Ord.	6	9⅜	+ ¼	*7 0 8
do. Pref.	6	10	—	6 0 0
Gt. Northern Tel.	22	35	—	6 5 9
Indo-European	10	60	—	6 10 0
Marconi	10	1 3/8	— 1/16	5 5 3
New York Tel. 4½	4½	97 3/8	—	4 11 10
Oriental Telephone Ord.	10	1 1/8	— 1/16	5 8 1
do. Pref.	6	1⅛	—	5 6 8
Tel. Egypt Deb.	4½	80	—	5 0 0
United R. Plate Tel.	8	5½	— 1/16	*8 6 6
do. Pref.	5	4⅝	—	5 2 7
West India and Pan.	1	1⅛	—	8 17 9
Western Telegraph	7	11⅜	—	*6 17 0
do. 4 Deb.	4	81	—	4 16 5
Home Rails.				
Central London, Ord. Assented	4	71	—1	5 12 1
Metropolitan	1½	24	+ ½	6 4 2
do. District	Nil	14½	—	Nil
Underground Electric Ordinary	Nil	1⅛	—	Nil
do. do. "A"	Nil	5/9	—	Nil
do. do. Income	6	70¾	+ ¼	*9 14 0
Foreign Trams, &c.				
Anglo-Arg. Trams, First Pref.	5½	87	—	7 1 11
do. 2nd Pref.	5½	8½	—	7 17 2
do. 4 Deb.	4	72½	+1½	5 12 7
do. 4½ Deb.	4½	72	—	6 5 0
do. 5 Deb.	5	74	+2	6 15 2
Brazil Tractions	3½	47	— ½	7 9 0
Bombay Electric Pref.	6	10½	—	5 17 1
do. 4½ Deb.	4½	87	—	5 3 0
Mexico Trams	Nil	33	—	Nil
do. 5 per cent. Bonds	—	40	—	Nil
do. 6 per cent. Bonds	—	85	—	Nil
Mexican Light Common	Nil	25	—	Nil
do. Pref.	Nil	30	—	Nil
do. 1st Bonds	—	40	—	—
Adelaide Sup. 6 per cent. Pref.	6	5	—	6 0 0
do. 5 Deb.	5	98	—	5 2 0
Manufacturing Companies.				
Babcock & Wilcox	14	2 7/16	—	6 8 5
British Aluminium Ord.	5	1 7/16	—	4 14
do. Pref.	6	18/8	—	6 9
British Insulated Ord.	15	10⅝	—	7 1 2
do. Pref.	6	5⅞	—	5 2 2
British Westinghouse Pref.	7½	32/6	—	9 7 6
do. 4 Deb.	4	68	—	5 14 4
do. 6 p. lien	6	101	—	5 19 0
Callenders	15	11	—	6 16 4
do. 5 Pref.	5	4⅛	—	5 11 3
do. 4½ Deb.	4½	92	—	4 17 9
Castner-Kellner	15	8½	—	4 12 6
Edison & Swan, £3 pd.	Nil	11/-	—	Nil
do. do. fully paid	Nil	1	—	Nil
do. do. 4 Deb.	4	58	—	6 18 0
do. do. 5% Deb.	5	60	—	8 6 8
Electric Construction	6	13/-	—	9 4 8
do. do. Pref.	7	19/-	—	7 7 4
Gen. Elec. Pref.	6	9½	—	6 6 4
Henley	20	14	—	*8 8 8
do. 4½ Pref.	4½	4½	— ¼	5 0 0
do. 4½ Deb.	4½	92	—	4 17 9
India-Rubber	5	8¾	—	5 14 8
Telegraph Con.	20	31	—	7 15 0

* Allowance made for dividends being paid free of income-tax.

Canadian General Electric Co., Ltd.—A quarterly dividend of 1¾ per cent. for the three months ending September 30th is announced, being at the rate of 7 per cent. per annum on the common stock; also a half-yearly dividend of 3½ per cent. for the six months ending September 30th, being at the rate of 7 per cent. per annum on the preference stock.

THE TREND OF ELECTRICAL DEVELOPMENT.

(*Concluded from page* 293.)

Mr. Paul M. Lincoln, continuing his presidential address to the American Institute of Electrical Engineers, says that one of the most pressing of our existing limitations to a reduction in cost of electrical apparatus is that fixed by temperature rise. The output of a piece of electrical apparatus increases with the temperature rise, and the temperature rise in turn is dictated by the point of balance between the rate at which heat is put in and that at which it is taken out. The rate at which heat is put in depends largely upon physical characteristics which are already being crowded to the limit by our modern designs. The rate at which heat is dissipated depends upon the efficiency of the ventilation methods used, and in this particular there is a considerable opportunity for improvement. The methods and devices for taking heat out of machines are just as important, when considering the temperature rise, as the prevention of heat from entering. The additional costs of applying the more efficient methods of dissipating heat will go far toward multiplying their tendency toward a reduction of cost.

However, there is one line of development that does promise some reduction in cost, and that is the tendency toward higher operating temperatures. In the past, the maximum operating temperature has been fixed by the disintegrating point of fibrous insulation, and this point has placed a very definite and logical limit to temperature rises in such machines. However, when types of insulation are used which do not have this definite temperature of disintegration, this reason for such a temperature limit disappears. Just how far we can go without exceeding the safe limits is as yet problematical; however, a limit to an indefinite extension in this direction is set by the temperature coefficient of copper conductors, the property that causes the resistance to rise with increasing temperature, thereby causing still higher losses, and in turn still higher temperatures. If we go high enough, we reach a point of unstable equilibrium in this temperature rise curve, where the apparatus will literally and automatically "burn out." This point is, of course, far above anything that is projected at the present time.

In the matter of power production, therefore, although we have steadily improved in the past, both as to costs and as to performance, and although we may expect to continue this steady improvement in the future, we can see ahead of us a definite limit beyond which it will be impossible to improve the methods of power production now in use. So long as we continue to get our power from falling streams and burning coal, we need not expect to see the same radical improvements in the future as have distinguished the past. The revolutionary improvements in power production methods of the future must come in a fundamental change of method rather than in the continued improvement of existing methods.

In the matter of utilisation of power a few comparisons with the past may not be amiss. The progress of the future will undoubtedly come from improvements in methods of application, and in this direction the field is inexhaustible. For instance, the problem of applying electrically the large amounts of power which are demanded by our modern railroad trains has not yet received a solution which is satisfactory to all concerned. The devising of methods for the application of electricity to our modern industries constitutes the occupation of no small part of our fraternity; it is along this line that we may expect much of what the future may have to offer us of a revolutionary character.

After the telegraph, in point of time, the electric light was the first practical application of electricity.

Most of our modern development in electrical engineering has taken its initiative from the supply of electric lighting to our communities. Kennelly in his 1898 address said, "The price of a 16-c.p. incandescent lamp 16 years ago was about $1.00. Now it is about 18 cents. The best lamps at that time, under laboratory conditions, gave about 0·28 mean horizontal British candle-power per watt, and under commercial conditions about 0·20. The highest pressure for which they could then be obtained was about 110 volts. At the present time lamps are obtainable giving normally 0·4 mean horizontal British candles per watt, while under commercial conditions the average lamp normally develops about 0·25 candle per watt. They can also be obtained (at 0·25 candle per watt) for pressures up to 240 volts, and are frequently installed on 220-volt mains."

The introduction of the metal-filament lamp has enabled us to-day to record a much greater rate of improvement in efficiency than Kennelly did. He reported an improvement of about 50 per cent. in efficiency in the 16 years previous to 1898. In the 17 years since Kennelly wrote, we have improved our maximum efficiency about 1,000 per cent., an advance which is truly marvellous. But here is a field where we have a long way to go yet without reaching a possible limit. It is true that the melting point of the now available materials seems to place the limit of lamp efficiency at a point not much higher than that which we have at present. However, when we come to compare the efficiencies of even our best lamps with that attained by the fire-fly it is evident that we still have a long way to go before we have reached perfection.

In the matter of power transmission, progress during the past few years has been remarkable. In 1898 the record reads: "The electric transmission of the power of falling water is a branch of engineering that has come into service since 1884, and is making rapid strides, owing to the recent successful employment of high voltages and multi-phase alternating currents. It has been estimated that about 150,000 kw. of this class of machinery is installed in the North American continent, commercially transmitting power to various distances up to 85 miles, at various pressures up to 40,000 volts." Since Kennelly wrote, 17 years ago, the maximum transmission voltages have gone up about three and three-quarter times; the maximum then was 40,000, and now is 150,000 volts. The maximum distance of transmission has gone up about three and a half times, 245 miles as against 85, and the installed capacity of water power plants on the North American continent about nine times, 1,350,000 instead of 150,000 kw. Kennelly also mentions in his record that "insulation testing sets have been made for producing alternating pressures up to 160,000 volts effective." In this respect we can go at least 10 times better than he reported, 1,000,000 volts from transformers having been made available on more than one occasion, and in some cases the voltage available from transformers has been pushed even higher. This matter of power transmission has advanced with probably greater rapidity than in any other branch, but we are approaching some fairly well defined limits in these matters. For instance, in the question of increasing transmission voltages we are close to the corona limit. There are, of course, methods of increasing the voltage range somewhat before corona is produced, such as increasing conductor diameter, but it can be readily seen that the limits of such remedies will be reached long before transmission voltages have increased by the same ratio as they have in the past 17 years.

Another limit that we are approaching in the matter of power transmission is the economic one. There obviously is a limit to the investment that can be made in transmission lines, and still be able to supply power with the same economy as it can be generated upon the ground. This consideration, coupled with the rapid advance in methods of generating power from steam, has placed an economic limit to the transmission of water power, so that we cannot expect any such advances in the future as the past 10 or 15 years have given us.

Transmission by high-voltage direct currents has received some attention of recent years. While there is no question but that the problems of pure transmission are much simplified by the use of direct currents, the accompanying problems of the generation and utilisation are so much intensified that nothing is to be gained in this manner. Probably no material advance will be made in direct-current transmission unless some means, as yet undeveloped, is found by which its generation and utilisation are made easier and safer than is possible at present.

Electricity is no longer the infant that it was formerly pictured, and cannot be expected to continue the rate o

growth of the infant. It is attaining the vigour and strength of manhood. It is contrary to natural law that either a child or an industry can have rapidity of growth and at the same time strength and stability of character. Unquestionably the rapidity of our development is not so great now as it was when Kennelly spoke in 1898, and in this respect we are but following a natural law. At the same time, our vocation is acquiring a stability and performance that are absolutely incompatible with the rate of growth that characterised our earlier years.

AN ELECTRIC FERRY.

The small country town of Strausberg, situated some 25 miles east of Berlin, with about 9,000 inhabitants, has several features of interest to electrical engineers.

The 40,000-volt transmission lines of the Märkische Electricitätswerke (an "overland" system) pass within a mile of the town, and serve it through sub-stations and a low-tension overhead distribution network belonging to the municipality. There is one sub-station close to the main 40,000-volt line, where the pressure is transformed down to 5,000 volts for the surrounding rural supply, and in the town there is another sub-station connected by underground cables with the first, which transforms from 5,000 volts down to distribution pressures. This sub-station also contains a small A.C.-D.C. converting plant. Both belong to the Town Council. A noteworthy point is the absence of a gas supply.

The characteristically quaint cobbled streets and plastered houses contrast strangely with centre-hung flame-arc lamps and an unusually obtrusive distribution network. The old and partly ruined tower, shown in fig. 1, is used as a centre for the latter, and, though this may verge upon vandalism, it must be admitted that the belfry constitutes an excellent protection and support for the numerous wires.

The township is situated on the side of a lake two miles long at a point where the width is only about 170 yd., but from which the road distance round either end is nearly 3 miles. For many years, therefore, the municipal ferries have had to cater for a considerable traffic. Originally there was a hand-propelled chain ferry, and later, a similar craft driven by an oil-engine.

In 1913, however, there was installed a ferry propelled by an electric motor through the agency of an overhead trolley wire.

The boat itself is a flat raft, 45 ft. long by 20 ft. beam, with a deck-house on one side and a roof; as may be gathered from figs. 2 and 3, no attempt has been made to adopt such "lines" as would tend to minimise the water resistance, but lee-boards have been fitted in order to reduce side-drifting.

The motor, control-gear, gearing, &c., are mounted in the deck-house.

Resting upon the bed of the lake, and kept taut by a winch at one end, is a stranded galvanised steel rope $\frac{5}{8}$ in. in diameter, which passes round a 3-ft. hauling drum on the boat, and incidentally serves as the return conductor for the current. The motor drives this drum through two belts and a countershaft, which thus form double-reduction gearing.

The electrical equipment was supplied by the Sachsenwerk Co., of Dresden, and consists of a $7\frac{1}{2}$-B.H.P. 220-volt protected type series-wound direct-current motor, a drum type reversing controller with metallic resistances, a D.P. switch and fuses, an ammeter, and five metallic-filament lamps. The positive conductor is an ordinary trolley wire of hard-drawn copper 9 mm. in diameter, stretched between two 30-ft. lattice masts, one on each side of the lake, and insulated from them by strain insulators. In spite of the long span and the necessity for limiting the sag, the masts are of comparatively light construction. They are set in concrete blocks and have each only a single wire stay.

During the winter it was fonnd necessary to insert a stout spiral steel spring and an adjusting device in one end of the wire, in order to enable the sag, due to temperature variations, &c., to be taken up more satisfactorily.

Along the trolley wire there runs a collector consisting of a single light over-running wheel attached to the raft by a flexible single-core insulated copper cable.

The cable passes through a vertical bell-mouthed tube in the roof of the deck-house. The slack varies considerably, not only on account of the sag in the trolley wire, but also due to the drift of the raft when exposed to a side wind; the same difficulties had therefore to be met as in those systems of railless traction which employ over-running collectors.

At first a spring drum was relied upon to wind in the slack cable, but this required occasional assistance from the ferryman before it would consent to perform its pseudo-automatic function.

An improvement was effected by the substitution of hanging weights and pulleys suspended from loops in the cable. These are arranged on the side of the deck-house. About $3\frac{1}{3}$ minutes are occupied in crossing the lake, and at busy times the ferry plies almost continuously. The operating results have given distinct satisfaction.

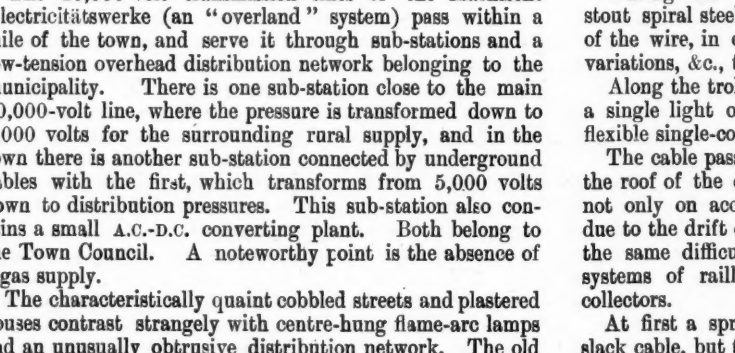


Fig. 1. Figs. 2 and 3.

As with all rope ferries, the management is simple; the attendant has only to operate the controller and to collect the toll, as the raft pulls itself automatically up to the landing stage and into the required position.

There would, however, appear to be a case for the provision of fore and aft rudders to enable the leeway due to a side wind to be counteracted, so that the boat would always travel under the trolley wire.

It happens that this lake is not connected with the main waterways of Prussia, and therefore no hindrance to navigation is involved by the overhead and submerged wires. Otherwise special precautions would be necessary, and this is a consideration which would, no doubt, limit the sphere of application of the system elsewhere. On the other hand, it may be pointed out that the considerable width of this lake is a factor which renders the trolley system less readily applicable in this case than in many others.

There is one other ferry of generally similar construction, and this is in the Province of Brunswick.

Several obvious advantages may be claimed for the trolley ferry. The power required is a minimum, because the motor hauls upon a fixed point, and there is no slip, or eddies, as with a propeller or paddle-wheel.

Cheap power is used; the weight, losses and maintenance of a battery and the frequent repairs and adjustments of an internal-combustion engine or steam engine are all avoided, whilst a large power house can employ the most economical prime movers. Stand-by losses, such as occur with an oil engine when running between journeys, are absent. The

ferry is always available for immediate use. The simplicity of the equipment reduces the attention required to a minimum. Electric lighting is available. Smoke, noise, and smell are entirely absent.

In conclusion, it may be suggested that, although the necessary electric supply is not so generally available, there are many cases even in England where a similar system might advantageously be adopted.

THE DOUBLE AUDION RECEIVER FOR CONTINUOUS WAVES.

The audion as well as any other detector can be used with the heterodyne receiver if local high-frequency current for "beat" forming be generated by an auxiliary high-frequency alternator or Poulsen arc. De Forest's "ultraudion," being capable of producing continuous oscillations of great purity though small energy, should be suitable for use as a local high-frequency generator in any heterodyne receiver set for continuous waves, the ultraudion oscillation circuit being coupled loosely to the aerial and the beat frequency equalling the difference between the frequencies of the received continuous wave and the ultraudion circuit. Using with such an outfit, an ordinary audion as receiver, two-fold amplification of signal strength is obtained :—(*a*) Due to the heterodyne principle itself.* (*b*) Due to the audion being worked at a point where the incoming signal releases a store of energy from the local high-potential battery. An interesting method of using two audions in cascade as an amplifying beats-receiver for continuous waves, so as to secure both of the above and possibly one other amplification, is described in a recent issue of the *Electrical World*, by A. H. Taylor, who cites a number of observations made at Grand Forks (N.D.), showing that the double connection is well worth while.

As receiver for regular spark stations the author uses the apparatus shown in fig. 1. The transformer secondary leading to the second audion is closed through a very small stopping capacity, and is itself the secondary of a ½-in. spark coil

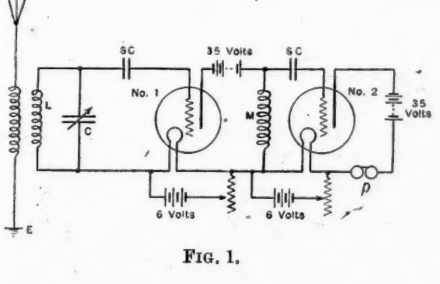


Fig. 1.

used as auto-transformer. When receiving signals from a spark station, the high-frequency oscillations received in the first audion are converted to a series of unidirectional impulses. If the stopping condenser in the second audion circuit be large, these impulses pass through it bunched in the form of low-frequency groups corresponding to the spark pitch of the sending station, but if the second stopping capacity be very small only high-frequency pulses will pass through.

In the first case the second audion will amplify the low-frequency groups by energy from its high-voltage battery, and in the second case it will amplify individual high-frequency pulses and deliver them to its telephone circuit smoothed out by telephone inductance in low-frequency groups. The transformer M completes the circuit of the No. 1 audion high-pressure battery, but offers sufficient impedance to prevent short-circuit of the low-frequency groups or high-frequency pulses. To prevent amalgamation of current from the first audion into low-frequency pulses, the stopping condenser of the second audion must be of very small capacity (*ca.* 0·0005 mfd.). With ordinary spark station reception both audions are adjusted to maximum sensibility, preferably by varying the audion heating current.

With this arrangement, continuous oscillation signals are not received as tones in the telephone unless there is simultaneously impressed on the circuit a local high-frequency current. It is possible to find an adjustment of the audions such that local high-frequency current is produced within them, thus dispensing with the external generator generally employed for heterodyne reception. In order that a rectifying detector may produce high-frequency oscillations from direct current, on the Poulsen arc principle, R^2 must be less than $4\ L/C$, and, in general, the audion does not act as an oscillator owing to its high resistance. By burning the audion filament at abnormally high brilliancy, on the verge of the blue glow point, the tube resistance is much reduced and local high-frequency oscillations may be produced, their presence being made evident by a hissing noise in the telephone.

Working on this principle, the inductance L, fig. 1, must be large and the capacity C small, the product (L C) corresponding to the wave length received. The audion must be worked at higher temperature than corresponds to normal maximum-sensibility adjustment, and only bulbs showing the hissing effect should be used. The adjustment of the second audion is found to be the more important. The best conditions for each bulb must be found experimentally, but fortunately they are very constant. The high-pressure battery voltage should be rather less than gives best results in ordinary spark-signal reception, adjustment from the latter to beat-tone reception being made by changing the filament temperatures. It is very important that there be no "dead" high-resistance cells in the flashlight batteries making up the high potential source, because, particularly in the first audion circuit, the damping effect of such a high-resistance cell would be very serious. Best results are obtained with an adjustment generally near to that producing the "siren" effect, which must strictly be avoided in beat-tone reception.

The above-described cascade connection of audions permits signal and compensating waves to be separated very easily, signals being received with great purity and distinctness, using a very loose coupling. The pitch of the beat signal note is entirely under the operator's control, and is best kept fairly low for stations of long wave-length. At a wave-length of 7,500 m. (40 kilocycles), the beat pitches produced by 1, 2 and 5 per cent. deviation from perfect tuning are 400, 800 and 2,000 per second; at 1 to 3 per cent. asynchrony, there is negligible loss by de-tuning, but the loss is decided at 5 per cent. out of tune. Signal and compensating waves which cannot be separated by tikker give two different beats with the heterodyne receiver, and, if necessary, one beat can be tuned out completely. Most satisfactory results are obtained when receiving waves between 5,000 m. and 10,000 m.; shorter waves can be received, but the capacity required to fulfil the condition R^2 less than $4\ L/C$ becomes so small, that the limiting value of the stopping condenser is reached, and movements of the hand affect the receiving capacity enough to upset adjustment. Experiments still in progress seem to show, however, that waves as short as 300 m. can be received with an audion adjustment corresponding to local generation of oscillations.

"Beats-ultraudion" reception of signals from spark stations is at least ten times as sensitive as ordinary double-audion reception without the oscillating adjustment, but the loss of musical quality in the note is a serious handicap, and one which seems inevitable, since the continuous local oscillation combines with a damped oscillation having group frequency as emitted by the spark station. Tremendous gain in intensity is secured, but the net readability of signals through X's is not greatly increased, owing to the loss of their musical quality. On the other hand, "beats-ultraudion" reception of continuous waves is extremely efficient, because full amplification is retained and the beat-pitch, which is under the operator's immediate control, is of perfect musical quality.

* Denoting the received current by i_1 and the local high-frequency current by i_2, the increment of energy due to the incoming signal $= (i_1 + i_2)^2 - i_2^2 = 2\,i_1 i_2$ if i_2 be large as compared with i_1.

THE SELLING SIDE OF ELECTRICITY SUPPLY.—IV.

A feature of several new blocks of flats recently erected in London has been the elimination of fire-places in certain of the rooms, principally bedrooms. The owners have, doubtless, been influenced in arriving at such an important omission by several considerations. Economy of space would be one of these, while the clean sweep and larger effect of the unbroken walls adds considerably to the attractiveness of the rooms, and leaves the occupants more choice in the placing of furniture. The saving in labour and materials in connection with fire-places, mantelpieces, tiling for hearths, and chimney pots is considerable, even after the cost of wiring for electric heaters is deducted. After all, fires in bedrooms are the exception rather than the rule, and the ventilating value of a chimney is trifling when a fire is not on. For this purpose the open window is far more healthy. The provision of a fire-place may be really looked upon as a precaution against sickness, when it may be required to maintain an even temperature. In this respect a coal fire is very inefficient, the difficulty of regulating the heat, the risk of its going out, and the noise of tending it being drawbacks. There is also the risk of its smoking, a down draught being particularly dangerous in such a common complaint as bronchitis, or, in fact, any ailment connected with the respiratory organs. This risk is, by the way, equally present with a gas fire, perhaps in larger degree owing to the fumes being invisible.

It would be labouring the point to enumerate further the advantages that are to be gained by cutting out fire-places where possible, they are well known to all commercial electrical men; our aim in introducing the subject is that wider publicity may be given to the matter, and the arguments in its favour well pressed home to architects and builders. Such buildings offer another field in which electrical methods stand alone, and gas, oil, &c., are outsiders. There is, of course, no reason why the innovation should not be extended to houses. Dwellings without fire-places are, of course, no novelty in other climates more favoured than ours, and the writer was much interested in a conversation once held with an Australian architect. In that sunny land it appeared he had designed many houses, in which the only provision for damp and cheerless days was a lamp radiator.

Where such opportunities as these are offered there is a fine chance for the new business department to co-operate with the landlord and fit up one of the flats or houses as a show place. In return for some free current for showing prospective tenants over after dark, and to demonstrate the efficiency of the electric heaters, there should not be much difficulty in introducing a very complete equipment, including electric cookers, irons, vacuum cleaners, &c. There is some scope here for the display of good taste in fixing up fittings. As the wall paper, &c., will be left for the tenant to choose, some regard must be had for giving a warm effect. Therefore, in the dining-room a nice rise and fall pendant of the corona type, with a cardinal red shade, should be introduced. Experience has shown that this is the most popular colour, and many fittings manufacturers only stock this shade, moss green, and old gold for this class of fixture. In the drawing-room a semi-indirect fitting might well be placed, one of those pink alabaster bowls giving a charming effect, with the delicate tracing of the veinings showing up when lighted. In the sitting-room or library this type might also be introduced. For the best bedrooms suitable two-light slide fittings with pink silk shades are probably the best. The thing should be done thoroughly, with lanterns in the porch, perhaps another inverted fitting in the hall, and some of the scientific residence shades, of which there are now many types upon the market, on the single-drop pendants.

Of course, fittings appropriate to the class and style of the residence must be selected. A safe rule would be to avoid anything very ornate. Oxidised silver, copper, and the dull finishes are popular, and should be certainly used in the dining-room, and also in rooms such as bedrooms where the points are close to the windows. Portable lamps must not be forgotten, and a floor standard in the drawing-room; it is rather a pity to see these big standards dropping out of favour, they add largely to the furnished effect of a room. The exhibition would not be complete without an electric fan in the kitchen, a hot-plate coffee percolator, and a kettle in the dining-room; in short, some of the numerous electric appliances should be introduced wherever possible. The radiators should be of more than sufficient capacity for the rooms, in order to impress their heating power upon the visitor. The hall must not be overlooked; a good radiator here will make the whole place attractive and comfortable.

All these fittings should be clearly priced, and in the case of heaters and appliances the energy consumption at full and other degrees mentioned. The ticketing can be thoroughly carried out with advantage; for instance, where two or more point switch control is provided, the functions of the switches should be explained on show-cards, simple directions for use placed by the cooker, and so on.

A percentage might be added for fixing, as in the case of the particular show job being taken over it would not be always possible to get anything to cover this item.

All this may seem a lot of trouble to take, but such an exhibition is extremely valuable from an advertising standpoint, and reaches those people with whom one is most anxious to get into touch. There are, of course, a few difficulties in carrying out such a scheme. One is the protection of the property displayed; usually, however, there is an agent of the landlord at hand or a clerk of works, and the actual risk is small. It may be found necessary to supply a few small tables for the standards and appliances, and a good supply of publicity matter should be kept on them as well. There is some satisfaction in remembering that our gas opponents are handicapped in giving such displays, as the effect on the ceilings if the model flat was long in letting would begin to be apparent. It would perhaps be advisable to install a time switch to prevent possible wastage.

THE ELECTRICAL EQUIPMENT OF THE ARGENTINE BATTLESHIP "MORENO."

By H. A. HORNOR.

(*Abstract of paper read before the* American Institute of Electrical Engineers.)

The *Moreno* is one of the two super-dreadnoughts building in the United States for the Argentine Republic. The general characteristics of the vessel are as follows:—

Length overall, 594 ft.; displacement, 27,566 tons; draught, 27 ft. 9 in.; width, 98 ft.; main battery, twelve 12-in. breech-loading rifles mounted in six turrets; torpedo defence battery, sixteen 4-in. and twelve 6-in. breech-loading rifles.

Power for all purposes is supplied by four 375-kw. turbo-generators of the horizontal type. Two of these machines are located forward and two aft on the lower platform deck below armour. Adjacent to each dynamo room is a distribution room in which is located a main distribution switchboard for the control of the two units and the supply circuits. On the gun deck is a third dynamo room containing two Diesel oil-engine-driven generators of 75 kw. capacity for harbour use when fires are drawn.

The 375-kw., 230-volt, 1,500-r.p.m. turbo-generators (fig. 5) are of standard marine design, capable of operating at a steam pressure of 220 lb. per sq. in., condensing at a normal vacuum of 28 in., and also non-condensing with 5 lb. back pressure. The turbine is of the well-known Curtis horizontal, two-stage type, fitted with automatic valve gear, inertia governor, and an emergency valve for automatically closing when the speed exceeds 10 per cent. above normal. Forced lubrication is provided for the main bearings, and the oil is cooled by water circulation. The generator is a compound wound, direct-current, commutating-pole type, mounted on the same bedplate and directly coupled to the turbine. The magnet frame is circular in form and divided horizontally. The generator is capable of standing 33⅓ per cent. overload for two hours and 50 per cent. overload for five minutes.

The Diesel oil-engine-driven sets are rated at 75 kw., 375 r.p.m., 230 volts. The generator is directly connected to the oil engine, but not mounted on the same bedplate. The generators are designed in a similar manner to the main generators.

Current is carried to all the various systems on a two-wire metallic system, by means of rubber-covered, lead-sheathed, steel-armoured cables, clipped singly, or in groups, to the ship's structure or clipped to special sheet steel pans supported from beam to beam or fastened to the plating. Water-tight fittings are provided wherever the cables terminate and

when passing through water-tight bulkheads. Twin conductors are employed from 3,256 cir. mils up to 30,856 cir. mils, and beyond this single conductors up to 373,737 cir. mils. All the conductors in this installation are stranded, lead-covered, steel-armoured, with the exception of the flexible leads in the turret trunks and special brass-covered wire and three-conductor rubber-insulated "Kuhlo" wires, used for branch leads in the officers' quarters and staterooms.

Besides the two main distribution switchboards, fig. 4, adjacent to the two dynamo rooms, there are two auxiliary distribution boards located one forward and one aft; a control

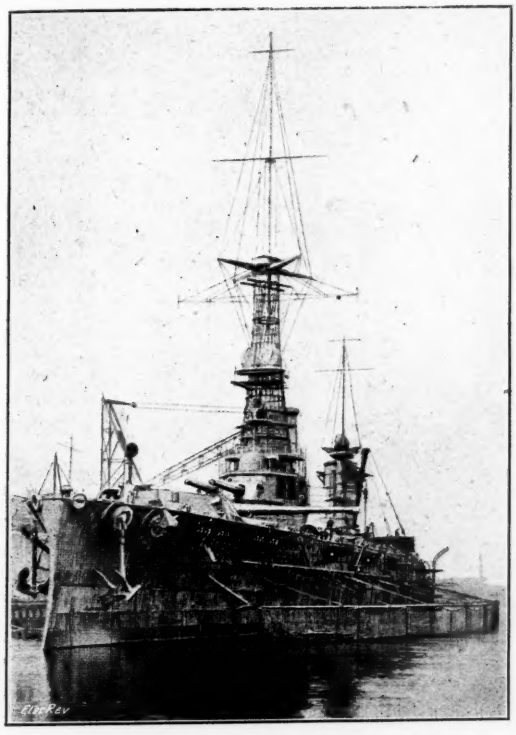


Fig. 1.—The Argentine Battleship *Moreno*.

board for the oil engine generators; and a combined distribution and control board for the searchlight balancer sets. These boards are all interconnected so that the supply will always be available. The interconnecting circuit breakers are fitted with interlocking devices and reverse-power relays, so that by no possibility will the generators in one room be thrown in parallel with those in another room. The distribution switchboards are designed with separate bus-bars for positive lighting and positive power and a common negative. It is possible, therefore, to divide the load in various ways between the different dynamo rooms. To facilitate this, voltmeters and

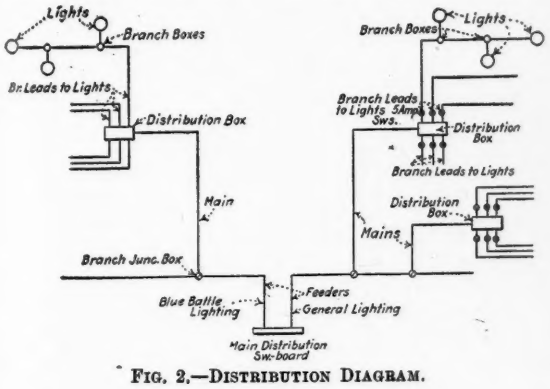


Fig. 2.—Distribution Diagram.

ammeters are connected in the local and remote circuits, and a diagram of the bus-bar connections is painted in grooves on the front face of the oil-finished slate panels.

The vessel is provided with, approximately, 3,000 lighting fixtures. The design is similar to the usual water-tight vapour-proof globe type used in marine work. The screw-base lamp socket is, however, made solid instead of a spring, a composition-insulated base provided instead of porcelain, and the globe is flanged and held in place by the guard instead of being screwed into the base. In the magazines and shell rooms, specially guarded fixtures containing two lamp sockets are installed. The lamps in these fixtures are connected to different circuits so that the failure of light in these compartments may be averted. Both carbon and tungsten incandescent lamps are furnished; the former in sizes of 35 watts and 60 watts, clear; the latter in sizes of 32 watts, clear, frosted, and tubular. A special fixture containing a 250-watt tungsten lamp and provided with a reflector is arranged for portable connection in the engine, boiler, and dynamo compartments. The same type of fixture is also employed for coaling booms, propeller booms, and gangway lighting.

Life tests of the 220-volt tungsten incandescent lamps showed as high as 98 to 101 per cent. of the initial c.p. after 1,162 to 972 hours' burning. The spherical reduction factor for the tubular lamp was 0.96, and for the pear-shaped bulb (s-19) was 0.914.

The 38 lighting feeders are divided into three circuits; one for general illumination under cruising conditions, one for white battle purposes, and one for blue battle purposes. In

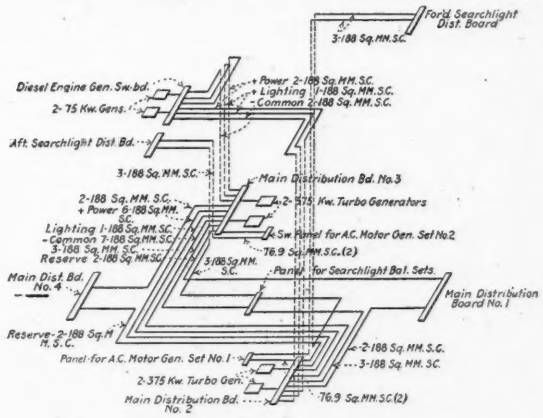


Fig. 3.—Diagram of Power Distribution.

this latter circuit the globes are of a deep blue colour, making the light invisible at a short distance. The distribution of the small lighting units has been made with due regard for cross circuits, so that no general spaces of the vessel may be put in darkness by the blowing of a fuse or any other failure of an individual circuit. The distribution of these lights was based on the number of candle-power per cubic foot of space to be lighted; thus in the admiral's quarters a maximum of 0.08 c.p. per cubic foot was required, and in the store-rooms a minimum of 0.01 c.p. per cubic foot. Each officer's stateroom of ordinary size is provided with one fixed light, one portable light, and an outlet for a 12-in. portable electric fan.

As shown in the diagram (fig. 2), the feeders are led from the main distribution switchboard to approximately their centre of distribution. Mains are then branched from the

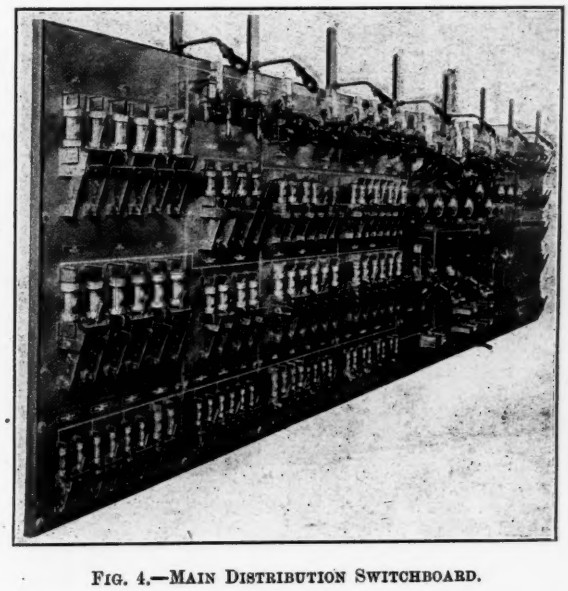


Fig. 4.—Main Distribution Switchboard.

feeder, and terminate in fused distributing panels of water-tight construction. From these panels branches are led off to the individual lights. Not more than four lights (one ampere) are allowed to depend upon the same fuse. The branch leads are all of 1.6 mm. (3,250 cir. mils) twin conductor.

For night battle purposes the vessel is equipped with 12 motor-operated, remote-electrically-controlled 110 cm. searchlights (fig. 8) and one portable signalling projector of 35 cm. As these projectors operate more satisfactorily when supplied with 110 volts, it was considered advisable to transform the 220-volt supply circuit through special balancer sets. Two such machines are installed in the vicinity of the oil engine dynamo room, wherein is located the control switchboard for them and the distribution board for the searchlight feeders. Each balancer set is rated at 70 KW., 1,000 R.P.M., 110 to 220 volts, the full load current on the neutral being 637 amps. They are compound wound, the coils being connected to act accumulatively on the generator and differentially on the motor. The series and shunt coils in one frame are connected across the armature of the other frame for the purpose of producing constant voltage at each end. The sets will maintain a difference of potential not in excess of seven volts under any conditions of load with an impressed E.M.F. of 220 volts.

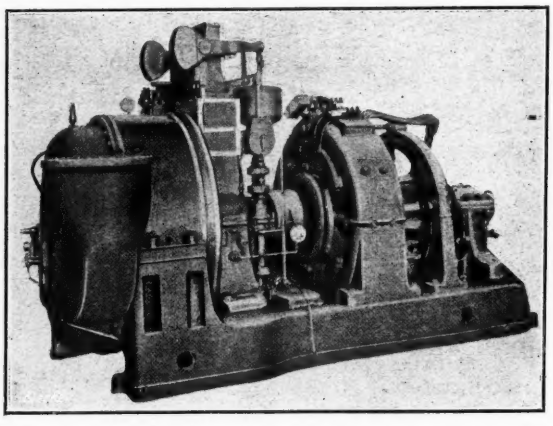


FIG. 5.—375-KW. TURBO GENERATOR SET.

Fig. 6 is a wiring diagram of the searchlights when the carbons are apart, fig. 7 the same with the carbons together; considerable time is saved by the employment of a shunt motor for automatically adjusting the carbons in preference to a compound wound motor. The twelve 110-cm. searchlights are similar in every respect, except that one projector is equipped with a remote-electrically-controlled signalling shutter. The lamp mechanism consists of a small electric motor which functions through gearing and so moves the carbons. The field and armature of the motor are controlled by a differential relay and two auxiliary relays, which cause

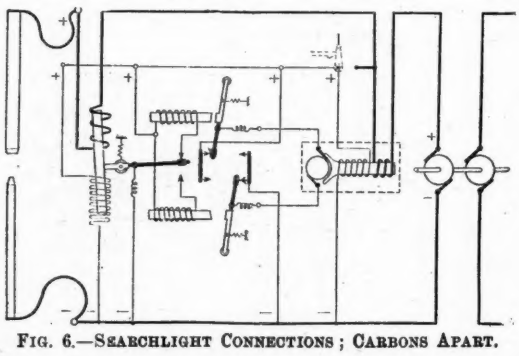


FIG. 6.—SEARCHLIGHT CONNECTIONS; CARBONS APART.

the armature either to stop or rotate to right or left. The first takes place with current and voltage normal, the second when the amperage is too high and the voltage too low, and the third when the last condition is reversed. Besides the regular field winding there is an additional winding on the motor field to carry the full lamp current. This produces a strong field when the voltage across the arc falls below normal and furnishes a dynamic braking effect for retarding the movement of the motor armature. For signalling purposes the searchlights are equipped with iris shutters similar to camera shutters. These are all manually operated except one, in which latter case a Venetian blind shutter, remotely controlled, is also provided. The optical arrangements are such as to provide rapid means for changing over from a dispersed to a closed beam of light. This is accomplished by means of a double disperser, consisting of two parallel systems of plano-convex cylindrical lenses, which may at will be drawn together or separated. A sighting telescope attached to the side of the drum; a complete lamp telegraph indicating the positions of the searchlight at the controller; and a set of electrical instruments, consisting of a voltmeter and ammeter, are furnished with each searchlight. A complete horizontal cycle of the searchlight may be accomplished either in 28 seconds or, approximately, 15 minutes, by means of the electric remote control. This control may be detached and the mechanism operated locally by hand.

The following list shows the extensive applications of electric power and gives the rated load for each equipment. These numerous equipments have their special uses and are

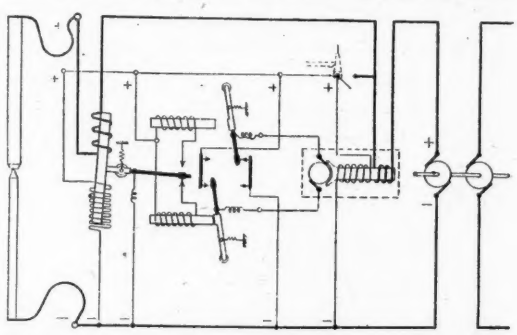


FIG. 7.—SEARCHLIGHT CONNECTIONS; CARBONS TOUCHING.

brought into action in general upon different occasions. Such systems as the ventilation system, sanitary pumps, etc., are continuously in service; but, on the other hand, the deck machinery, such as boat booms, deck winches, coaling winches, etc., are only used when in port coaling, handling small boats, etc. In like manner, the turret machinery is only used under battle conditions or for practice drills.

No.	Equipment.	Rated H.P.	Total H P.
2	Boat boom hoisting	50	100
2	Boat boom topping	30	60
4	Deck winches	35	140
16	Ammuniti n hoists	3	48
6	Ammunition hoists	5	30
12	Forced-draught blowers	35	420
1	Anchor windlass	100	100
1	Capstan	100	100
2	Coaling winches	150	300
1	Steering gear	150	150
3	Bilge pumps..	70	210
14	Bilge pumps..	35	490
2	Searchlight balancer sets	93	186
1	Fire pump	60	60
2	Fresh-water pumps	6	12
2	Sanitary pumps	25	70
1	Drainage pump	3	3
2	Thermo tank pumps	35	70
3	Turbine lifting gear	20	90
1	Laundry	6	6
1	Printing press	0·25	0·25
3	Speed signal balls	0·5	1·5
1	Cake mixer	1	1
1	Dough mixer	2·5	2·5
1	Diesel engine oil pump	1·75	1·75
1	Diesel engine cooling water pump	2·7	2·7
12	Turret turning	25	300
12	Gun elevating	15	180
13	Turret hoists	7·5	97·5
5	Turret hoists	12	60
1	Dryer room	1	1
1	Röntgen ray equipment	5	5
1	Vacuum cleaner	0·33	0·33
1	Electro-mechanical hammer	5	5
2	Torpedo air-compressors	90	180
5	Refrigerator pumps	19·5	97·5
5	Brine pumps	3·5	17·5
2	Ozoniser motor-generators	1·3	2·6
2	Ozoniser pumps	0·5	1
9	Elevators	4	36
1	Wireless motor-generator	18	18
2	Alternating current motor-generators	37	74
1	Dish washer	1	1
1	Meat slicer	0·5	0·5
1	Meat chopper	1	1
1	Potato peeler	1	1
1	Ice-cream freezer	1	1
1	Egg beater	2	2
1	Extension lathe	3	3
1	Tool-room lathe, 14 in.	0·75	0·75
1	24 in. shaper	3	3
1	80-in. radial drill	2·5	2·5
1	16-in. sensitive d ill	0·75	0·75
1	14-in. tool-room lathe	0·75	0·75
1	Grindstone	1	1
1	46 in. boring mill	3	3
1	Cutter and grinder	1	1
1	Tool-room lathe, 14 in.	0·75	0·75
1	Sensitive drill, 16 in.	0·75	0·75
1	Lathe for armourer's workshop	0·75	0·75
1	Shaper for armourer's workshop	2	2
1	Sensitive drill for armourer's workshop	0·75	0·75
1	Forge blower	0·75	0·75
1	Foundry blower	5	5
1	Athletic horse	2	2
1	Moving-picture machine	17·6	17·6
9	600-cb. ft. ventilation fans	4	36
9	1,600 cb. ft. ventilation fans	1	9
1	1,600-cb. ft. ventilation fan	2	2
6	2,500 cb. ft. ventilation fans	1·5	9
24	2,500 cb. ft. ventilation fans	2·75	66
3	2,500-cb. ft. ventilation fans	3·5	10·5
4	5,000-cb. ft. ventilation fans	3·25	13
6	5,000-cb. ft. ventilation fans	6	36
2	5,000-cb. ft. ventilation fars	6·75	13·5
7	6,000-cb. ft. ventilation fans	3·75	26·25
5	6,000-cb. ft. ventilation fans	7	35
2	8,000-cb. ft. ventilation fans	5	10
6	8,000-cb. ft. ventilation fans	9	54
2	10,000-cb. ft. ventilation fans	6·25	12 5
3	12,000-cb. ft. ventilation fans	7·5	22·5
2	15,000-cb. ft. ventilation fans	10	20

As shown in the cable scheme for power distribution (fig. 3), the feeders from the main distribution switchboards in some cases lead direct to motor starting panels, in others they branch into mains, and in others lead to special distribution panels. The latter is so in the case of the 4 in. and 6 in. ammunition hoists, the searchlights and the 12 in. turrets. The turret distribution panel is located on the revolving part of the turret and is encased in a water-tight steel box.

As shown in the illustration (fig. 10), a variety of motor types are used, viz.: Open, semi-enclosed, fully-enclosed, and enclosed ventilated. Small motors, up to 10 H.P., are regulated by simple starting and field control panels; above 10 H.P. drum controllers are employed. On very large equipments for special services requiring from 50 to 150 H.P., contactor control with dynamic braking is provided.

The electrical steering gear equipment is designed as an auxiliary to the steam steering engine, operates through the same telemotor gear on a "follow-up" system, and furnishes only sufficient power to carry the rudder from hard-over to hard-over in 40 seconds, which is half the time requirement

of the steam gear. The motor is of the commutating-pole open type, compound-wound, rated at 150 H.P., 400 to 600 R.P.M., 220 volts. The controlling appliances comprise a master controller and limit switch mounted in one case, a contactor panel, and the necessary field and armature rheostats operated by the same. In the master controller are two cylinders provided with rings; these make electrical contact with plungers; one of these cylinders is for the controller, the other for the limit switch. Both cylinders turn freely on their

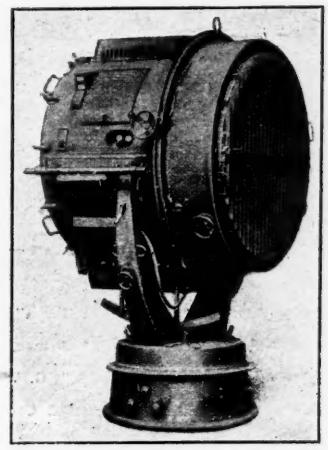


FIG. 8.—ELECTRICALLY CONTROLLED SEARCHLIGHT.

supporting shafts. The controller cylinder operates through a connecting rod from the operating shaft of the steering gear. The limit switch cylinder operates through a sprocket chain from the main steering gear shaft. The differential gear, or "follow-up" device, is located between the two cylinders, and is designed to turn the controller cylinder off by motion of the main shaft of the steering gear which turns the limit switch. The latter strengthens the field of the motor when the rudder is displaced more than 10 deg. from the midship position. The mechanical connections are such that the motor will stop when the rudder has reached the angle for which the steering wheel has been turned. The motor field cannot be weakened until all of the accelerating contactors have closed, after which the controller will maintain full field until it has been turned through an angle corresponding to 3 deg. movement of the rudder from starting position, and intermediate field from 3 deg. to 5 deg., after which the motor will run at weak field until the rudder has reached 10 deg. from the midship position. Mounted upon the contactor panel are 10 armature contactors, two field contactors, one disk brake contactor, two counter E.M.F. contactors, an overload relay, a double-pole, fused, control switch, and a single-pole testing switch. The overload relay controls four of the five accelerating circuits; when it operates, resistance is introduced into the armature circuit, and the field rheostat short-circuited so that the motor is protected against continued overload without being actually stopped. In this manner accidental loss of control of the rudder cannot occur. The limit switch is arranged to stop the motor at the 35-deg. position of the

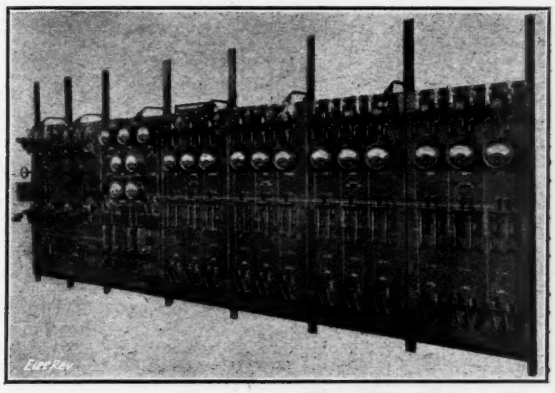


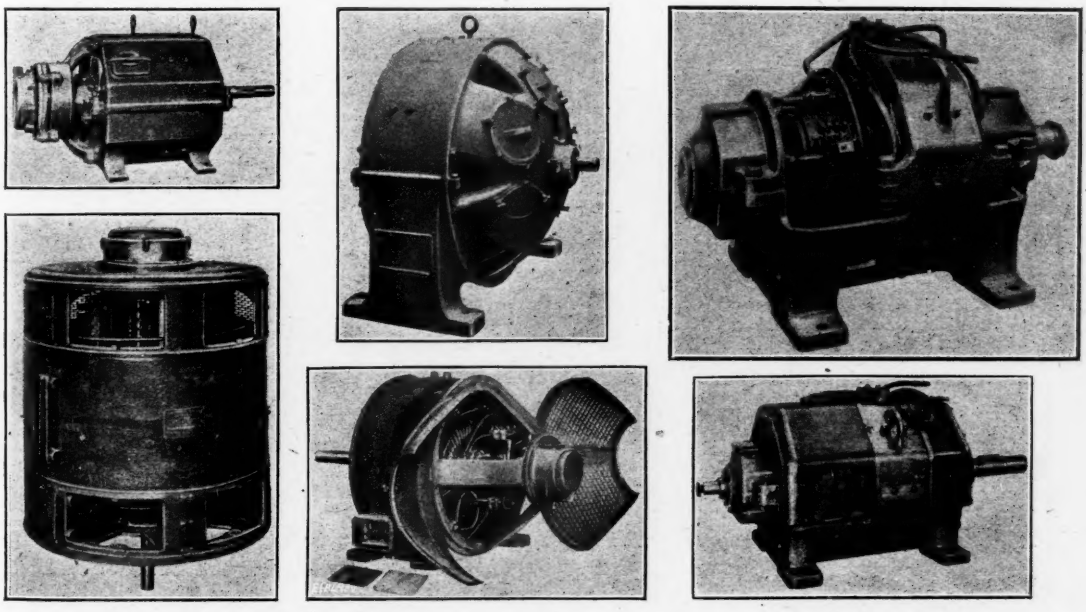
FIG. 9.—SEARCHLIGHT DISTRIBUTION SWITCHBOARD.

rudder. Dynamic braking is provided in connection with the electro-mechanical disk brake in order to provide prompt stopping. The rudder can be turned at slow speed throughout its travel, provided the steering wheel is turned slowly, thereby permitting the motor to turn the controller cylinder backward as fast as it is turned forward by the steering wheel. This may be accomplished while the controller cylinder moves back and forth between limits corresponding to 2.25 degrees motion of the rudder, as the motor will start with a motion of cylinder equivalent to 0.75 deg. movement of the rudder and the field will be weakened with 3-deg. similar motion.

The turret turning and gun elevating gear are operated by constant-speed motors, and speed variations are accomplished by mechanical means. Ventilation blowers in the turrets are similar to the regular hull ventilation fans, except for increased pressure. The independent hoists complete the electric power equipment of the turrets. The main ammunition hoists are operated by hydraulic power and the electric hoists are provided as an auxiliary. Two upper hoists are fitted in each of the six turrets. These are operated by 7.5-H.P. motors. One lower hoist is fitted in each turret, of which one is operated by a 7.5-H.P. motor and the other by 12-H.P. motors. As these equipments are generally similar in their operation only the 12-H.P. lower hoist will be described.

The apparatus consists of a contactor panel upon which are mounted the accelerating contactors, overload relay, current-limit relay, and voltage relay; the master controller located at the bottom of the hoist; the emergency controller located

Boat boom motor. Forced-draught fan motor. Coaling winch motor.



Bilge-pump motor. Hull ventilation fan motor. Anchor windlass motor.

FIG. 10.—TYPES OF MOTOR EMPLOYED ON THE BATTLESHIP *Moreno*.

at the top of the hoist; the limit switch and rheostats. By means of automatic interlocks on the contactors the connections are regulated between the master controller, limit switch and emergency or upper controller; so that upon turning the master controller to the "on" position the disk brake releases and the motor starts. When the hoist, therefore, reaches its limit in either direction dynamic braking is introduced and the motor stops. When the operator at the top of the hoists desires to stop the hoist he turns the emergency controller to the "off" position, the contactors operate automatically and stop the motor. If the limit switch is now left in an intermediate position the motor will automatically start when the emergency controller is turned to the "on" position. If the limit switch has been turned to the "off" position by the hoist then the motor will not start until the master, or lower, controller is turned to the first controller notch. In case of overload, the overload relay through the interlocks will open the contactors automatically and stop the motor. The hoist cannot be started again until the operator returns the master controller to the "off" position, which permits the plunger of the overload relay to drop. It is necessary to unlock the reversing cylinder of the master controller mechanically in order to use the hoist for lowering. The connections for this operation are so arranged that the accelerating contactors and current-limit relays are inoperative, and suitable resistance is introduced in parallel with the armature and a large current capacity resistance connected in series with the armature and starting resistance, by reason of which the hoist will lower slowly. Other functions lowering are similar to those of hoisting.

The electrical anchor windlass acts only as an auxiliary to the steam windlass, and is designed to function at half the normal load of the steam gear. The outfit comprises a 100-H.P., 475-R.P.M., compound-wound, commutating-field motor of the open type, and is equipped with a disk brake; two watertight, drum-type, reversing master controllers, one mounted in the windlass room and one mounted on the weather deck; a contactor panel containing the accelerating contactors, a step-back relay, overload relay, a double-pole, single-throw disconnecting switch with field discharge clips, a small single-throw testing switch, and a low-voltage relay. The control is semi-automatic, *i.e.*, the first three speeds are controlled by the master controller, but beyond that the current-limit relays on the contactors will prevent them from closing until the current in each preceding one has been reduced to a predetermined amount, regardless of the position of the controller cylinder. The set-back relay will open the contactors in case the load should be increased beyond that for which the set-back relay has been set, and it will introduce all of the starting rheostat except two sections, thereby reducing the current to about 25 per cent. overload on the motor. The overload relay will be set considerably higher than the set-back relay, thus protecting the motor in case of excessive overloads. The overload relay is reset by bringing the controller to the "off" position. The armature and commutating field coils are permanently connected and, consequently, are reversed together. The low-voltage relay prevents the equipment from starting automatically after failure of current, requiring the controller to be brought back to the "off" position, whereupon the circuit will be re-established.

The Rontgen ray outfit is arranged for supply from a 220-volt D.C. circuit, and is located in the operating room adjacent to the sick bay.

A portable moving picture machine is an unusual feature; the apparatus is supplied by a 220-volt circuit, and the films are rotated by an adjustable speed 220-volt D.C. motor.

(To be concluded.)

NEW PATENTS APPLIED FOR, 1915.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

12,103. "Method for localization of faults on electric cable networks." F. E. Frampton. August 23rd.

12,119. "Sparking plugs for internal-combustion engines." A. Watkins. August 23rd.

12,120. "Connectors for electrical conductors." A. Watkins. August 23rd.

12,133. "Electrical instruments." S. F. Palmer & Ferranti, Ltd. August 23rd. (Complete.)

12,143. "Electrical switchgear." E. A. Graham. August 23rd. (Complete.)

12,150. "Connector for the adjacent portions of two or more wires, cables, or the like." A. H. Fargo. August 23rd. (Complete.)

12,151. "Connector or coupling for the adjacent end portions of two or more wires, cables, or other members." A. H. Fargo. August 23rd. (Complete.)

12,184. "Vapour electric devices." British Thomson-Houston Co., Ltd. (General Electric Co., U.S.A.) August 24th.

12,193. "Insulators for electrical resistances and conductors." A. E. Woodhouse. August 24th.

12,201. "Electric alarm or calling devices used in telegraph receiving apparatus, and more particularly in wireless receiving apparatus." A. H. Morse & Indo-European Telegraph Co., Ltd. August 24th.

12,232. "Electric switches." B. L. Hutchison & A. Hutchison. August 25th.

12,240. "Sparking plugs and the manufacture of same." T. Crosbee and Sons, Ltd., & W. J. Spicer. August 25th.

12,246. "Systems of electrical distribution." British Thomson-Houston Co., Ltd. (General Electric Co., U.S.). August 25th. (Addition to 4,133/14.)

12,252. "Electrolytic processes and apparatus." F. W. Gauntlett. August 25th.

12,253. "Secondary galvanic batteries." O. Oldham. August 25th.

12,256. "Thermic telephones and like instruments." R. Aernout, Baron van Lynden, & Naamlooze Vennootschap de Nederlandsche Thermo-Telephoon Mastschappij. August 25th.

12,267. "Controller and circuit making and breaking device having a closed field." L. Renault. August 25th. (Addition to 24,121/14. Convention date, August 26th, 1914, France.) (Complete.)

12,276. "Attachment of insulator-carrying arms to telegraph and like poles." Bullers, Ltd., & H. C. R. Dagnall. August 26th.

12,282. "Appliance for cataphoresis and anaphoresis by fixed electrode." J. T. Jameson. August 26th.

12,299. "Electric cable couplers." British Thomson-Houston Co., Ltd. (General Electric Co., U.S.) August 26th.

12,301. "Electro-magnetic clutches." G. Gabet. August 26th. (Convention date, August 27th, 1914, France.) (Complete.)

12,309. "Electric switch apparatus." F. A. Rose. August 26th.

12,314. "Electrical instruments." S. F. Palmer, J. Denham & Ferranti, Ltd August 26th.

12,318. "Electric heating and cooking apparatus." C. G. Nobbs & W. W. Nobbs. August 26th.

12,340. "Electrical control systems." British Westinghouse Electric and Manufacturing Co., Ltd. August 27th. (Convention date, September 25th, 1914, U.S.) (Complete.)

12,343. "Apparatus and method for electric telegraphy." A. A. Govan. August 27th.

12,351. "Automatic electrical signalling on railways." W. A. Minchin. August 27th.

12,361. "Systems of electric ship propulsion." British Thomson-Houston Co., Ltd. (General Electric Co., U.S.) August 27th.

12,379. "Electrically-operated mercury switches." G. Wilkinson. August 28th.

12,402. "Electric motor controllers." Electric & Ordnance Accessories Co. Ltd., & N. G. Langrish. August 28th.

12,404. "Telephone systems." E. V. Datzevitch. August 28th. (Complete.)

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4,526. Telephones particularly for use in Collieries and the like. A. Dootson. February 21st. (August 21st, 1914.)

11,629. Electrically-controlled Point-operating Mechanism for Railways and the like. R. V. Collins. May 11th. (Convention date not granted.)

11,630. Electric Railway and like systems. R. V. Collins. May 11th. (Convention date not granted.)

13,699. Apparatus for Electro-plating Wire and the like. V. F. Feeny. (Fabrik Elektrischer Zünder.) June 5th.

16,316. Telephone Installations in which the Subscribers' Lines are grouped according to the frequency of the calls. Siemens & Halske Akt. Ges. July 8th. (September 25th, 1913. Addition to 28,751/12.)

16,661. Means for pulling off Electrical Overhead Conductors or Contact Wires. Siemens Schuckertwerke Ges. July 13th. (July 12th, 1913. Addition to 30,045/13.)

16,860. Protective Arrangements for Electric Installations. Siemens Schuckertwerke Ges. July 15th. (July 15th, 1913.)

17,379. Automatic Protective Devices or Cut-outs for Electric Circuits. Siemens Schuckertwerke Ges. July 22nd. (July 23rd, 1913.)

17,548. Arrangements for Regulating the Working of Electric Hauling or Winding Machinery. Siemens Schuckertwerke Ges. July 24th. (July 26th, 1913.)

17,602. Controlling Devices especially applicable for use with Electrically-operated Printing and Stamping Machines. M. Rockstroh. July 24th. (Addition to 4,678/10.)

17,755. Writing or Copying Telegraphs Telepantograph Ges. July 27th. (July 28th, 1913.)

17,763. Electrolytic Production of Alkali Metals. T. F. Johnson (Badische Anilin and Soda Fabrik). July 27th.

18,261. Motor-starting Rheostat. G. M. Johns. August 7th.

18,442. Electro-magnetic Unlocking and Unscrewing Apparatus for Miners' Lamps. O. Oldham. August 8th. (Addition to 2,249/14.)

18,504. Electric Igniting Apparatus for Gas Burners. C. C. Carpenter. August 10th.

18,509. Electric Switches. B. P. Swyers. August 10th.

19,506. Electric Condensers. W. H. Wilson. September 7th. (Cognate application, 3,660/15.)

19,729. Electric Incandescent Lamps. Deutsche Gasgluhlicht Akt. Ges. (Auerges). September 12th. (September 13th, 1913.)

20,374. Electric Discharging Tubes. B. Donath. September 30th. (October 10th, 1913.)

20,556. Switch for Testing Telegraph Lines. E. D. Gledall. October 5th.

21,650. Composite Conductor Cables and method of making same. E. C. R. Marks (Aluminium Co. of America). October 28th.

22,113. Overhead Conductor Arrangements for use at Cross-overs or Switches on Electric Railways or the like. C. B. Burdon (Siemens Schuckertwerke Ges.). November 6th.

23,170. Electric Sound for Detecting Presence of Metallic Bodies in Living Animal Tissues. D. Findlay. November 27th.

23,272. Electric Switches. J. H. Tucker & J. A. Crabtree. November 30th.

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611. Electrical Telegraph or Telephone Vibrators or Buzzers. A. H. Nicholson. January 14th.

2,370. Fusible Electric Cut-outs. J. Kluijtmans. February 15th.

2,482. Systems of Electric Distribution and Control. R. E. Hellmund. February 16th. (February 19th, 1914.)

3,007. Protrudable Receiver for Subaqueous Signalling. Signal Ges. February 24th. (February 25th, 1914. Addition to 16,298/13.)

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8,672. Alternating-current Motors of the Commutator Type. British Westinghouse Electric & Manufacturing Co. (Westinghouse Electric & Manufacturing Co.). June 11th.